THE AEROPLANE and ASTRONAUTICS

JUNE 19, 1959

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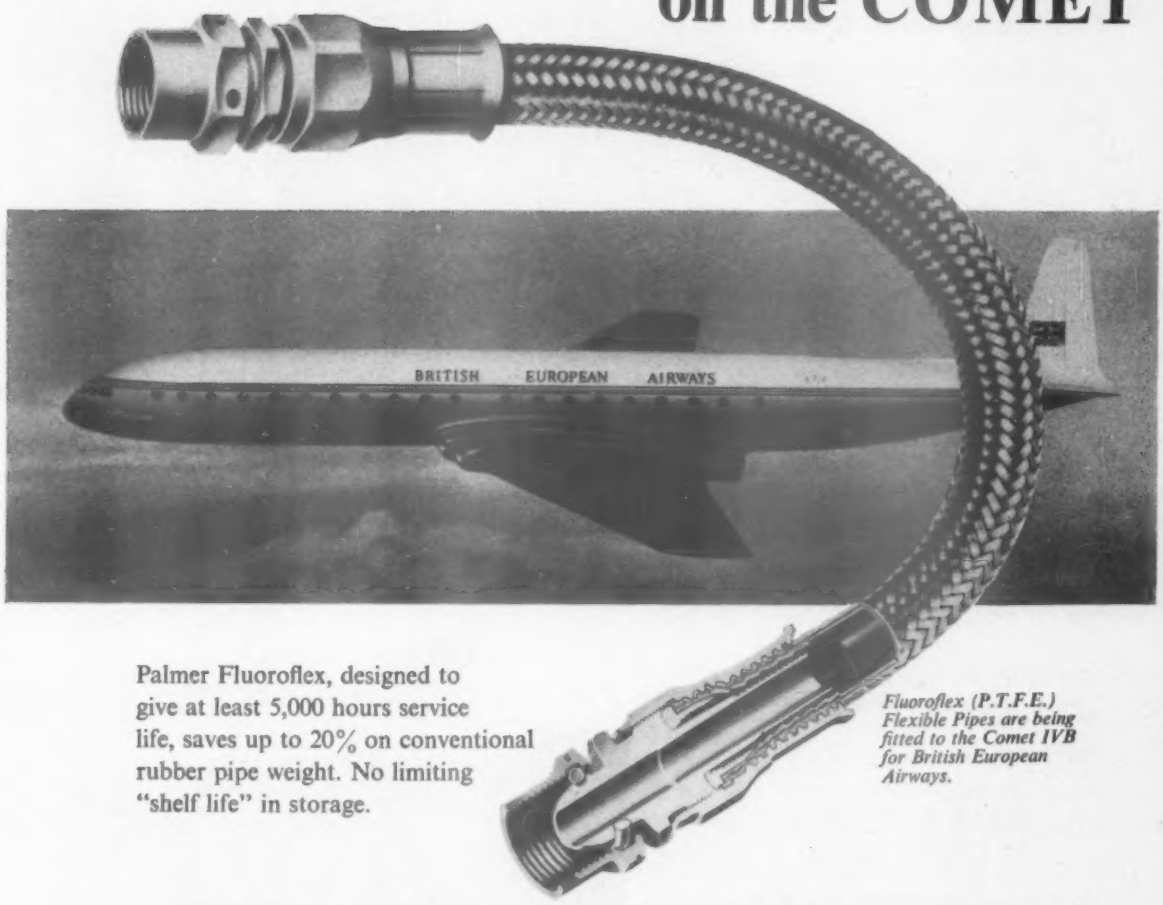

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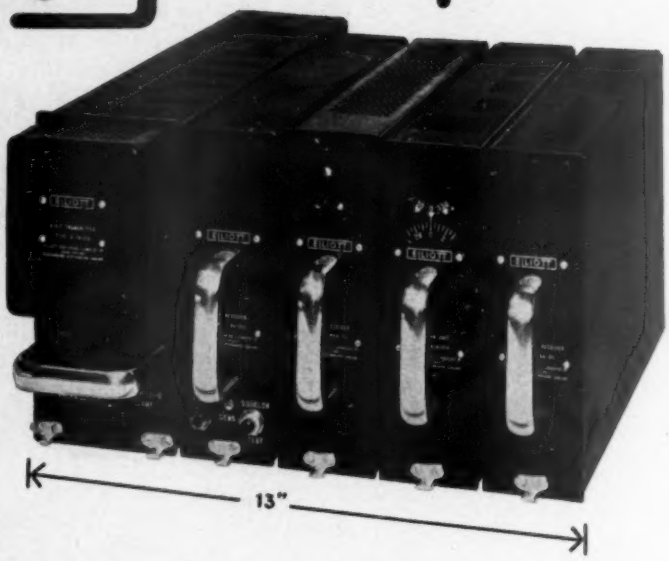

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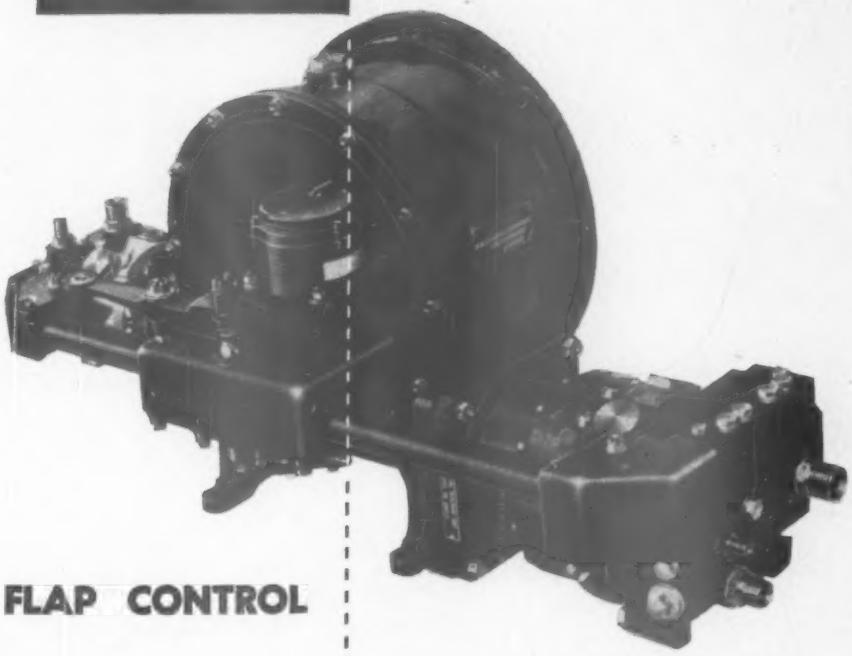

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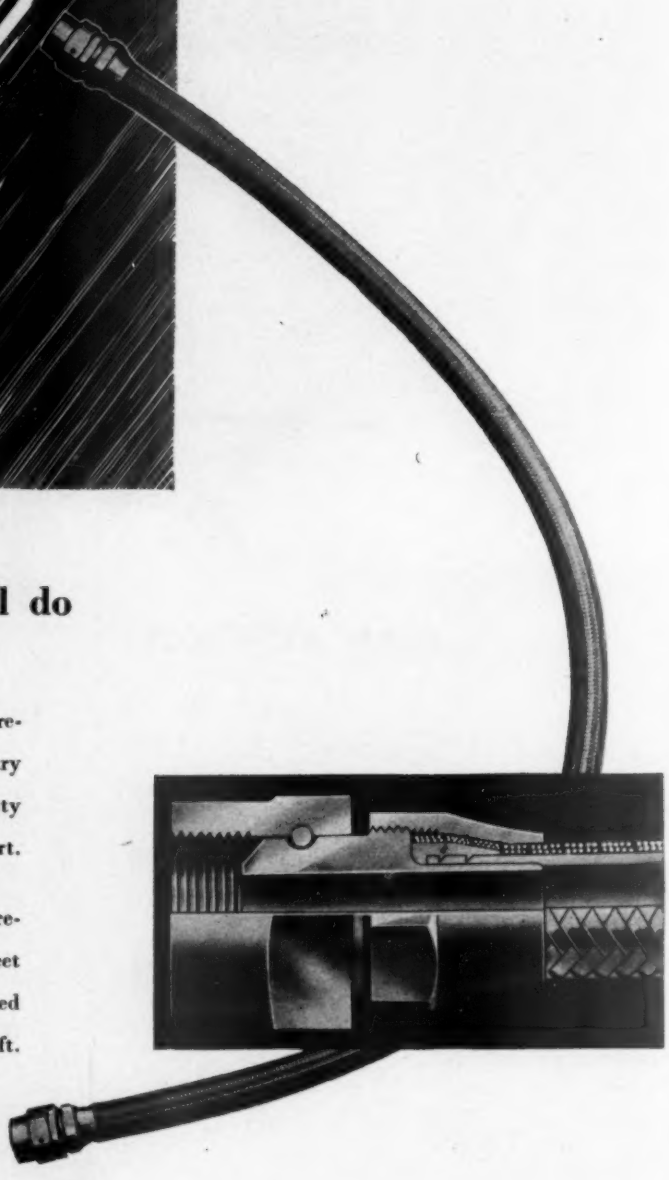

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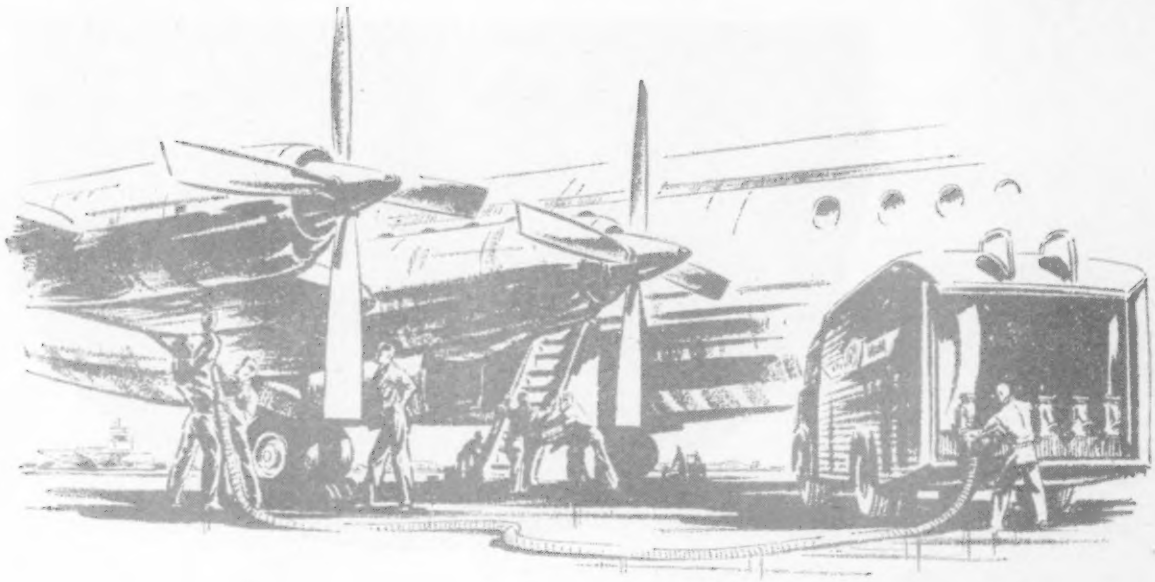

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(The Gannet is powered by a Bristol Siddeley Double Mamba engine)

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THE AEROPLANE and ASTRONAUTICS

VOLUME 96 NUMBER 2494 JUNE 19, 1959

A Welcome Step

No news could be more welcome to the British Aircraft Industry than a decision by the Government to assist manufacturers of civil aircraft in the development of their products for the international market. There have been many suggestions as to the manner in which this may be best done: a favoured formula that has been put forward many times is to make use of R.A.F. Transport Command. The argument has been that new aircraft in the early stages of development should be made available to the Service, which would subject them to intensive flying over the long stages of the R.A.F. international network.

The alternative, and one which has been favoured by many in the Industry itself, would be for the State Corporations to undertake this development. The Corporations, quite reasonably, argue that they are in business to make money, and that they cannot be expected to operate undeveloped aircraft. This negative approach by the Corporations could, it is obvious, be reversed if the Government were to make it worth their while to operate the aircraft under development. Hitherto no Government department has shown itself disposed to act as fairy-godmother in this matter. But it seems that a change is in the wind.

As reported elsewhere in this issue, we understand that B.E.A. is to operate two or three Handley Page Heralds under some arrangement with the Ministry of Supply. There has been talk of one of the larger independents operating the new Avro 748 under a similar arrangement. If this is confirmed, and we understand that an official announcement may be made before this issue of THE AEROPLANE AND ASTRONAUTICS appears, the decision will be welcomed. It is likely to be regarded as a further step towards easing the problem about which the leaders of the Industry have been expressing themselves so forcibly for some time now—the problem of financing development of such expensive undertakings as the Vickers VC-10 and the de Havilland 121 and the Fairey Rotodyne.

MAPAC—Press On!

We have from time to time referred to the existence and aims of MAPAC, the Manpowered Aircraft Committee. This body aims to encourage and co-ordinate the achievement of flight by human muscle-power only.

Soon this body of pioneering enthusiasts is to hold its first meeting as a group under the aegis of the Royal Aeronautical Society. This will not be a moment too soon, for not only are various designs nearing trial in this country, but there is activity in Russia.

Recently, the English-language *Moscow News* carried a story about a scientific and technical conference on manpowered aircraft, sponsored by the Manpowered Aircraft Committee attached to the Chkalov Central Air Club of the U.S.S.R. and attended by over 150 delegates from Kharkov, Sukhumi, Riga, Kazan and other towns, which took place in Moscow.

This Russian report states that there have been successful preliminary tests of an electrically driven ornithopter designed and built by I. Vinagradov; G. Sirman's pneumatically driven model rose into the air at Odessa in 1957 and made a flight at a height of some

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15 metres; D. Ilyin is working with a group of schoolboys in the Moscow Region on a design for a low-powered ornithopter with elastic wings mounted on a person's back (they have built two full-size prototypes and several models); an original manpowered glider and a similar aircraft but with a motorcycle engine, have been evolved by P. Otkrayev; good results have been attained by A. Ivanyuta, A. Vlasov, O. Cheranovsky. It also recalls that several years ago at Tushino A. Manotskov demonstrated his "Kashuk" glider with sprung wings.

The report ends with mention of the British Manpowered Aircraft Committee and of its president, Mr. H. B. Irving.

An Apology

Owing to production difficulties which are beyond our control we regret that it has been necessary to curtail the number of editorial and advertisement pages in recent issues. In consequence it has not been possible to include a report of the opening of the Paris Aero Show which took place after this issue closed for press. We hope that readers and advertisers will accept our apologies for the omission of some usual features and for such abridged reports of events as may be necessary while these difficulties remain.

Matters of Moment

Progress with the SC.1

FROM Short Brothers and Harland came the news last week that the SC.1 VTOL research craft made its longest free hovering flight at Belfast on June 2, remaining airborne for six minutes. During this time, Mr. T. Brooke-Smith, the company's chief test pilot, flew the aircraft for about a quarter of a mile over a concrete road and accomplished a number of turns and short sideways and backwards movements.

The take-off was made from the platform of the test gantry and the landing was on a metal platform on the runway. Gusty conditions prevailed at the time of the flight and, according to reports, provided a good test for the SC.1's control and stability. The next and final phase in the flight test programme is proper transition from a vertical take-off to full forward flight as an aeroplane. Both these have been accomplished separately and the next step will be the transition which is scheduled to "begin shortly."

NATO Early Warning Radar

IN October, 1957, Marconi's Wireless Telegraph Co., and the French company, Compagnie Générale de Télégraphie Sans Fil (CSF), agreed to collaborate in certain aspects of NATO work. Earlier this month the two companies announced that their proposals for the provision and installation of radar equipment for all the stations in the NATO Early Warning Chain have been accepted and that contracts are now being placed by the Governments concerned.

The total value of the contracts is approximately £7 million, covering, in addition to the supply and installation of equipment, the training of national personnel and assistance in technical maintenance after handover of the stations in operational condition. The majority of the stations will consist of a combination of equipment produced by the two companies, and although this work will be executed in partnership, Marconi's will carry the major responsibility for system and station planning and for installation.

Marconi's has been responsible for practically all the work involved in re-equipping Fighter Command's ground radar defences in Great Britain. CSF, on its side, has been responsible for technical achievements already adopted by the French Air Force to equip its early warning centres. The two companies are to award substantial sub-contracts to Italian industry.

A Co-operative Transport

TO meet a specification for a troop and supply transport drawn up jointly by the French and German Air Forces, a design is being prepared by a consortium of one French and three German companies. In one of the first international groupings of its kind, Blume Leichtbau und Flugtechnik, Hamburger-Flugzeugbau, Weser-Flugzeugbau and Nord Aviation are working together, both on the design and on construction of prototypes. The Weser concern is acting as manager.

The new transport is to be powered by two Rolls-Royce Tynes and will have a gross weight of about 90,000 lb. External dimensions are span, 131.2 ft.; length, 97.3 ft.; height, 38.2 ft. The cargo hold will have a length of 42.6 ft. and a cross section of 10.3 ft. by 9.7 ft.

SERVICE BRITANNIA.—On June 9 the Log Book of the first Britannia 253 (XL 636) of the twenty on order for R.A.F. Transport Command was handed over at R.A.F. Lyneham by Mr. Cyril Uwins to Wg. Cdr. J. O. Barnard, C.O. of No. 99 Squadron.

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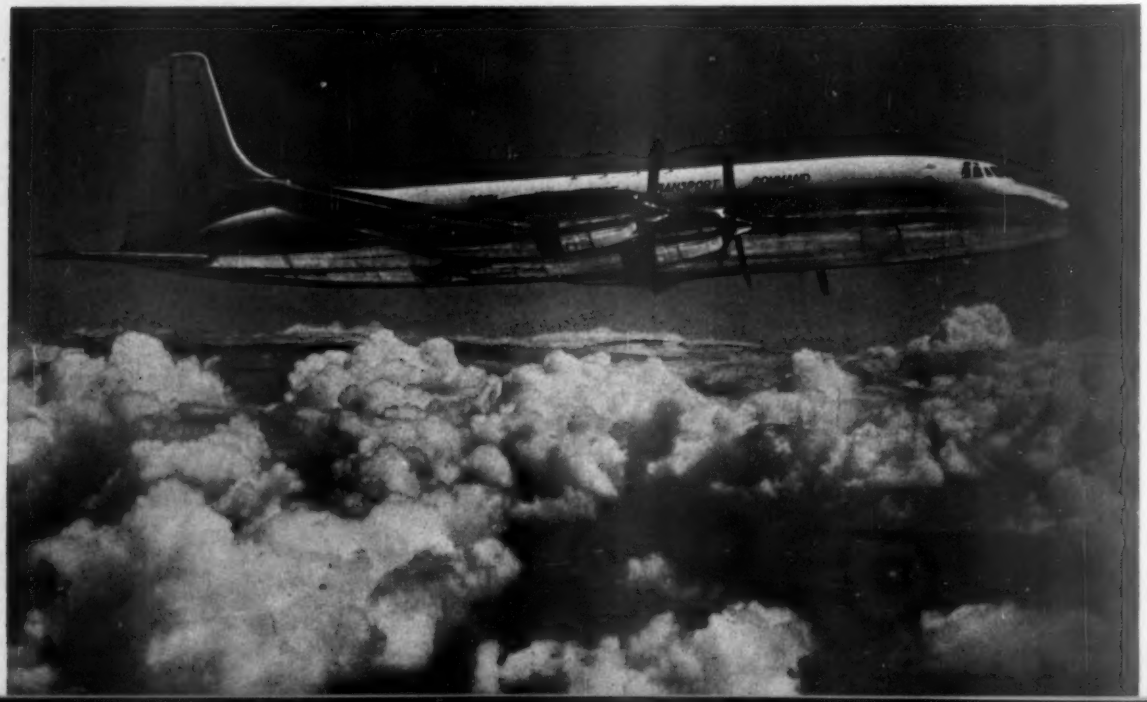


A Two-stage Supersonic Airliner

ACCORDING to a paper read before the American Society of Mechanical Engineers by three scientists from the Applied Science Laboratories, the rocket technique of staging can be applied with benefit to supersonic airliners. They propose a multi-stage arrangement with an acceleration aircraft boosting a cruise transport to operating speed and altitude.

The performance of this "two-stage airliner" has been calculated assuming that it must carry 60 passengers over a still-air range of 3,500 n.m. at Mach 4. The accelerating aircraft would have turbojets and the cruise vehicle ramjets plus a turbojet engine for landing. The two aircraft would take off coupled in tandem and separate after the cruise vehicle had been accelerated to Mach 4 at its operating height.

This two-stage vehicle was compared with a conventional transport designed for the same mission. The conventional aircraft weighed 192,000 lb. compared with 136,900 lb. total for the two-stager and would use 42,459 lb. more fuel.

London Aircraft Brokers

MR. P. T. GRIFFITH, who has recently been appointed managing director for The Babb Co. (Britain), Ltd., tells us that his office address is 188 Brompton Road, London, S.W.3. Telephone: Knightsbridge 9266. The other directors of this company are: W. A. Sipprell, U.S. (president), Major J. Stewart, O.B.E., and J. Dufour, Swiss.

Mr. William A. Sipprell is president of The Babb Co. Inc. of New York, which was founded by the late Charles Babb some 30 years ago. Today this concern claims not only to be the largest aircraft brokers in the United States but to have the largest organization of the type in the world, with offices in Paris and Geneva and consultants in every continent.

Mr. Griffith has spent over 40 years in British aviation. After doing some flying in 1917-18 he worked under the late Mr. Folland and then joined Ogilvie and Partners, leaving them to join Metal Propellors Ltd. His next position was sales director of the Williamson Manufacturing Co., Ltd. He retired as purchasing controller of B.O.A.C. at the end of 1958, having joined Imperial Airways in 1938.

Help for *Daily Mail* Competitors

A STATEMENT from Westland Aircraft, Ltd., makes it clear that this pioneer helicopter constructor is not to enter the great *Daily Mail* "Arch to Arc" Air Race as a competitor. Believing it to be a most imaginative and important contribution to the future of air travel, they will, however, make a helicopter available both in London and Paris free of charge to competitors who propose methods and routes which in the company's opinion usefully exploit the unique qualities of the helicopter for speeding up intercity travel. Service will also be available at Westland's London Heliport.

This announcement, which, we imagine, will be the most welcome news to potential competitors, is completely in accord with the far-sighted policy consistently followed by Westlands. From the beginning of the helicopter enterprise, and its roots go back to the inter-War years when so much pioneer work was done on rotating-wing machines at Yeovil, the company has unhesitatingly demonstrated its faith in rotating wings.

We, too, welcome this most generous act of faith for it must go far towards making certain that the *Daily Mail's* declared aim will be achieved—to improve passenger transport between the two capitals.

Mr. John Davison, O.B.E., managing director of the de Havilland Aircraft Co. of South Africa, is this year's president of the Chartered Institute of Secretaries. Principal guest at a luncheon on June 8 to celebrate the first election to this post of a member from the Commonwealth, was Sir Aubrey Burke, O.B.E., managing director of the de Havilland Aircraft Co., Ltd. Replying for the guests he found, as Wren has depicted, some analogies between Mr. Davison and the secretary bird.

Photograph copyright "The Aeroplane and Astronautics"

ENTER FAIREYS.—Among the dozen helicopters which attended the annual Rally of the Helicopter Association of Gt. Britain at Dunsborough Park on June 6, was the Rotodyne. This was its first appearance in public with its remounted wing and new aileron system.

Arch to Arc—Organizer's Viewpoint

From Mr. Stevenson Pugh.

H. A. TAYLOR'S article "Winning that *Daily Mail* Contest" (THE AEROPLANE AND ASTRONAUTICS, June 5, page 639) seemed to me to miss the main point of this contest. The race was originally my brainchild and, if only for this reason, I should like to comment on Mr. Taylor's arguments.

The article begins by attempting to rationalize the contest into either a "scramble race" for prizes and publicity or an opportunity to investigate seriously the problems of intercity transport. Mr. Taylor then shoots down the latter alternative by stating: "Undoubtedly something will be learnt from the exercise but it is questionable whether what is learnt will be useful to serious students of transport."

Surely, races inevitably involve the desire to win prizes and publicity. Nobody would dispute, for example, that these motives were honourably evident in the contests for the great aviation prizes promoted in the past by the *Daily Mail*. It could equally have been argued at the time that it was "questionable" whether these contests—be it Blériot's Channel crossing or Alcock and Brown's Atlantic flight—were "useful to serious students of transport."

Mr. Taylor regrets on the one hand that we did not propose a special prize or a handicap system to encourage day-to-day transport between "two more practical starting points" and on the other that we have ruled out the "splendid idea" of encouraging a zero-length launch of an F.100 from Hyde Park.

It should be recognized by your readers—I have certainly had it brought home to me in the detailed investigation which preceded the announcement of our race—that it is impossible to evolve handicapping for transport systems as diverse as a single-engined helicopter, a Caravelle and a Rotodyne. And could there be two more "practical" starting points for intercity transport between London and Paris than our chosen points at Arch and Arc?

As for "splendid ideas" they have been legion. Why not offer £10.000 to the first man to transport himself by SRBM (Short Range, etc.) between London and Paris? This would undoubtedly improve on the record time set up in your own remarkable "Hare and Tortoise" demonstration in 1948, but of what use would it be to Mr. Taylor's "serious students"?

No, Sir! Our race came about, first, because it was recognized that the *Daily Mail* could not let the 50th

Matters of Moment . . . .

anniversary of its first great aviation prize slip by without endeavouring to perpetuate a fine tradition. Secondly, this simple contest was born out of the recognition that miraculous strides in aviation development are now two-a-penny and are hardly likely to be accelerated much in practice by challenges from Fleet Street.

When Lord Northcliffe offered £10,000 for the first Atlantic crossing another publication derisively offered £1,000,000. This incident neatly illustrated that Northcliffe was on the right track and going about his proper business as a journalist.

Now, Sir, if you demonstrated a journey time between London and Paris of less than 47 minutes in 1948—under special conditions—and nothing has been done since then by "serious students" to push the everyday journey time in that direction, or if they have been obstructed in their efforts, then we have a ready-made challenge to an enlightened, aviation-minded newspaper.

The *Daily Mail* race is unlikely to improve on your record time. In fact we have gone out of our way effectively to ensure that it will not do so by embracing the whole transport problem—on the ground, in the air and, particularly among the proliferating laws and notions of our legislators.

Of course, we may tell "serious students" nothing that they do not already know. But the success of our race now seems sufficiently assured to guarantee that we shall give the subject a dusting. And if we achieve that—in full view of some millions of literate people in Britain and Western Europe—then international aviation will be, as so often in the past, much indebted to the *Daily Mail*.

[Mr. Pugh's points are well taken. He may, however, have missed some of the implications in H.A.T.'s gently satirical comments. For instance, the idea of zero-length launching of a Century-series fighter from Hyde Park can be considered as "splendid," only in its absurdity.—ED.]

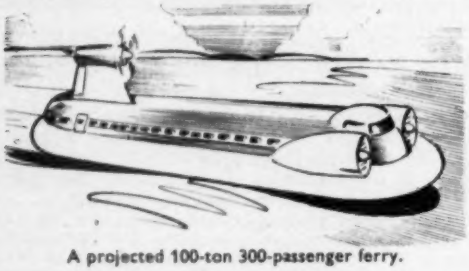
Air-cushion Transportation

AS all the World knows, the Cockerell Hovercraft, built for Hovercraft Development, Ltd., a subsidiary of the National Research Development Corporation, has successfully levitated itself and achieved translational movement. It has not "flown" and never will. Neither is it saucer-shaped. But to the B.B.C. and most of Fleet Street it is "Britain's first flying saucer."

What a lot of illusions are going to be shattered when it is found that the "flying saucer" cannot lift itself more than a few feet above the ground and is quite incapable of making a steep or vertical climb to great heights. And its designer never intended that it should.

On June 11, after a successful and convincing demonstration over concrete, the craft was taken to the water and showed its ability to move at low speeds under full control. In these early stages, clearly an important problem is that of the large curtain of spray thrown up by the jets.

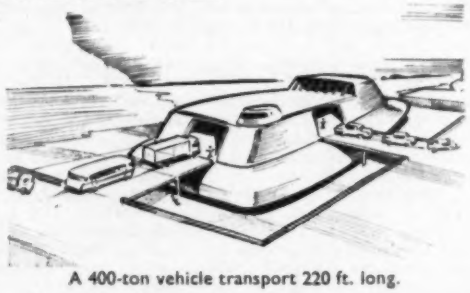
The whole object of the invention is to produce an amphibious vehicle which, having neither the water resistance of a hull nor the frictional resistance of wheels, shall be able to achieve economically very high speeds. The question of lift either by wings or propellers, fans or rotors, does not arise.



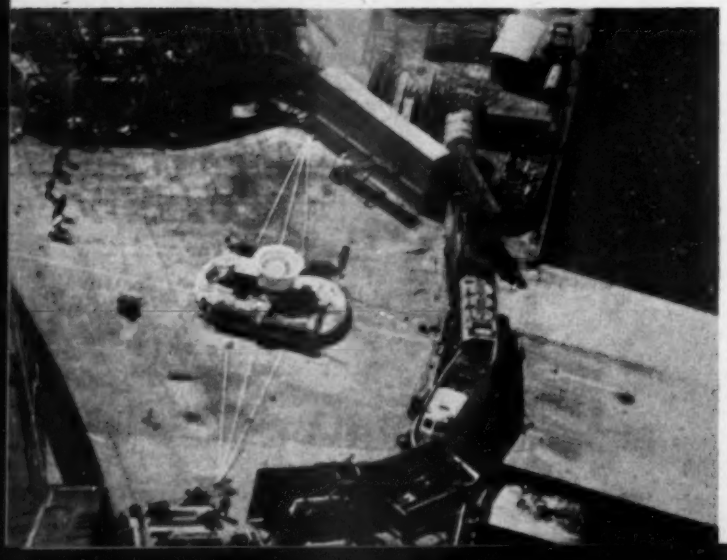
A projected 100-ton 300-passenger ferry.

The ingenious principle of this "ride-on-air" boat was outlined in THE AEROPLANE AND ASTRONAUTICS for April 24 last. We then explained that the basic lift principle of the Cockerell Hovercraft is the generation of a cushion of air of sufficient pressure to support it under the bottom surface. The cushion is contained within a curtain of air that flows from the craft to the ground in the form of two annuli which are directed from its periphery inwards towards the centre at an angle of approximately 30° to the horizontal. It is the force required to bend this air curtain outwards so that it is finally ejected away from the centre of the craft and in contact with the ground or water that dictates the magnitude of the cushion pressure that can be built up and sustained.

This cushion of air is carried along with the craft and any losses are replenished by the air curtains. The Hovercraft has inherent stability, in that the cushion pressure increases as the height of the craft drops and should it rise above its design height it suffers a loss of lift.



A 400-ton vehicle transport 220 ft. long.



The S.-R.N.1 was designed and built by Saunders-Roe in under eight months. It has an Alvis Leonides powerplant developing 435 h.p. driving a four-bladed axial fan which supplies the air for the curtains and propulsion thrust. It is designed to operate at heights of approximately 15 in. and at speeds of about 25 knots with the initial curtain configuration and propulsion system. Overall dimensions are 30 ft. long by 24 ft. wide and it has an approximate all-up weight of 7,500 lb. Rudder and elevator-type hinged control surfaces are at each end of fore and aft ducts, on each side of the axial fan, to give control about all three axes.

The Hovercraft's first practical application could be in fast ferries over medium distances, making possible, for example, a 10-20-min. journey between England and the Continent. The craft visualized for the rôle would be a 100-ton ferry capable of cruising at a speed of 90 knots and operating at a height between 1 and 4 ft. above the water. Its length would be approximately 130 ft. and it would carry 30 tons.

Other proposed applications for the craft include a land vehicle and a 400-ton long-range transport. The first would operate at speeds up to 100 m.p.h. and have a laden weight of 4½ tons. It could carry 16 passengers or 1½ tons of freight.

The long-range transport craft would be designed to cruise at 100 knots, operating at a height of between 3 and 8 ft. Approximately 220 ft. long, it would be capable of carrying a payload of 160 tons over stage lengths of about 300 n. miles.

It will be interesting to see whether the principle can be used to replace the retractable undercarriage gear on conventional aeroplanes. Much less power would be required to lift a high-speed transport off the runway by the Cockerell Hovercraft system than by direct-lift, as in the Short S.C.-1 vertical riser and similar types. It is in such a direction as this that the interest of the new inventions lies so far as aviation is concerned.

Air Transport

The Helping Hand

STARTING in mid-1960, British European Airways will operate a small number of Handley Page Dart Heralds, principally on selected domestic services. News of this important development for the Dart Herald was expected to be announced soon after this issue went to press. The B.E.A. order, indirectly, is an indication of Government financial support for the aircraft, on which Handley Page has spent some £3 million to date.

Now that the long-expected decision has been made to offer a measure of help to the Dart Herald, similar arrangements can be expected for the Avro 748. In this case, it seems likely that B.O.A.C. will be involved—as the Government's agents—although the aircraft will probably be operated by one of the B.O.A.C. associates, or, perhaps, on lease by Skyways, Ltd., who have already expressed an interest in the type. In both cases, the backing of a British operator will be of great value for prestige and, still more, to obtain early experience in airline service.

A New Air Ferry

AMBITIOUS plans for the extension of vehicle ferry services between this country and the Continent, involving the development of a new aircraft and the introduction of new routes, were announced last week by Channel Air Bridge—the vehicle ferry division of Air Charter, Ltd. Applications have been made to the A.T.A.C. for permission to operate on seven new routes—Southend to: Paris (Le Bourget), Bremen, Tours, Strasbourg, Lyons, Dijon and Dusseldorf—carrying vehicles, freight and incidental passengers. The Paris and Dusseldorf services, at frequencies of up to six and four a day respectively, would begin in the summer of 1960, and the remainder, at frequencies of two or three return flights daily, in the summer of 1961.

Although one or two experiments with longer routes in the past have not been very successful, Channel Air Bridge (and Silver City—see our issue for May 22, page 591) believe that enough traffic can now be obtained to make the proposed services worthwhile. One of the great problems for both these operators is the low aircraft utilizations possible on the present short-range routes—the average figure for Bristol 170s is around 1,000 hr. a year. Comparatively little traffic would be needed on the longer "deep penetration" routes to double this figure.

Initially, if approval is granted, Channel Air Bridge would use its fleet of nine Bristol 170s, but an essential part of this long-term development plan is the introduction of a new type of aircraft, starting in 1961. Called the ATL 98, this aircraft is a modification of the DC-4 specifically for vehicle ferry duties. The modification involves fitting a new front fuselage section, joining the old fuselage at a point just ahead of the wing leading edge, and introducing additional fin area.

The new front fuselage is reminiscent of the front end of the Bristol Freighter, with its hinged nose and high flight deck. The fuselage length of the ATL 98 will be 101 ft. 2½ in. compared with 93 ft. 5 in. of the standard DC-4, and, in this length, four or five cars (depending on size) can be accommodated, with 25 passengers. Gross weight will remain unchanged, at 73,000 lb., and the maximum payload will be of the order of 17,000 lb. Cruising speed will be 200 m.p.h.

Operating costs, it is estimated, will be some 15% higher than those of the Bristol Freighter on equivalent services. One of the most attractive features of the ATL 98 is its low first cost, taking advantage of the comparative cheapness of used DC-4s. Current quotations for C-54s and DC-4s on the Aircraft Exchange are in the range of $190,000-$215,000 each.

The design of the ATL 98 is the work of Aviation Traders, Ltd., at Southend, and has been approved by the Douglas Aircraft Company. The construction of the new front fuselages and the work of conversion will be done at Southend, where the first converted aircraft is expected to be ready to fly before the end of 1960. The fleet of 10 aircraft, required by Channel Air Bridge to operate their present and projected routes, would be in service by 1962. After completing the first batch of 10, Aviation Traders will offer the ATL 98 for sale to other operators.

A Temporary Recession ?

ACCORDING to the figures published in the 1958 annual report of the council to the assembly of the International Civil Aviation Organization the traffic on the World's scheduled airlines increased by only 5% in 1958. The overall financial position also appears to have worsened since 1957, when the operating ratio (revenue as a percentage of expenses) was 99—involving a total operating loss of about $41 million.

The rounded-off passenger-traffic figure for 1958 was 86,000 million passenger-kilometres by comparison with 82,000 million for 1957. But the significant—and perhaps hopeful—feature of the figures is that, though the United States carriers' total traffic continues to be well in excess of that of the remainder of the World's operators (with 59% of the whole), the U.S. increase was only about 1% against a figure of 12% for the remainder. Since the business recession originated in the U.S.A. and probably hit that country harder than any other, it seems likely that, with improved conditions there, the World increase this year may well turn out to be 10% or better. The highest quoted traffic increase for 1958 was for Belgium (33%) and the lowest, apart from the U.S.A., was the Netherlands (3%); the U.K. increase was 6%, though there was a 9% increase on international services.

After the good financial year of 1956, in which the recorded World's operating ratio was as high as 102.5 (with an overall operating profit of $84 million), the position deteriorated to a ratio of 99 in 1957 and preliminary figures suggest that the 1958 ratio will be as low as 96.1. Once again revenues rose—to an estimated level of $4,200 million—but expenses climbed still higher and the overall operating loss was of the order of $160 million. Revenues for all traffic averaged 41 U.S. cents per tonne-kilometre (59.9 cents per ton-mile) by comparison with 40.5 cents (59.1 cents) for 1957.

The Vanguard Abroad

IN order to demonstrate the Vanguard on-the-spot to interested airlines, Vickers flew the second aircraft (G-APEA) to Brussels on June 3 and to Rome on June 4. On both occasions, the aircraft returned to Wisley the same day, clearing Customs, both outward and inward, at London Airport.

As with the flight to Hamburg on May 6, these movements were made exactly to schedule and without mechanical troubles of any kind—using an aeroplane which made its first flight only on April 22. Details of the flights were as follows:—

	Distance	Time	Air Speed	Cruising Height	Wind
	st. miles	h. m.	m.p.h.	feet	m.p.h.
London—Brussels	230	45	308	15,500	−5
Brussels—London	230	43	320	16,500	zero
London—Rome	955	2 27	386	17,500	zero
Rome—London	949	2 35	370	22,500	−12

One interesting aspect of these flights is the way they have demonstrated the Vanguard's ability to achieve high block speeds. The time to Rome, for instance, compares with the fastest advertised turbojet schedule of 2 hr. 30 min. On the flights to and from Rome, take-off weight was 127,500 lb., including 32,000 lb. of fuel (4,000 Imp. gallons) and 15,800 lb. of "payload" of which some 10,000 lb. was accounted for by the test instrumentation.

FERRY PROJECT.—The Aviation Traders ATL 98, work on which is now proceeding at Southend, is a DC-4 with a new front fuselage. It promises to meet the highly specialized needs of the cross-channel vehicle ferry operators for a good many years to come.

Air Transport . . . .

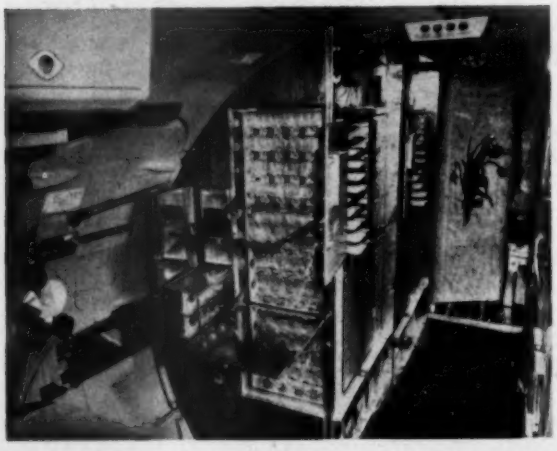
Modern Airline Passenger Accommodation

by E. J. Clark, A.F.R.Ae.S.*

ALTHOUGH the broad sense of the title of this article covers the full conception and design of a modern airliner, except perhaps for the fortunate few which are able to break ground as military transport aircraft, an attempt has been made to confine this survey to some of the problems associated with that portion of the passenger accommodation which is inside the structural shell. The relative briefness of this article is appropriate to the subject, wherein the principal design and engineering policy is to ensure that the utmost economic use is made of the space provided.

Much that is written is based on the experience obtained from discussion with potential Viscount operators during the past seven years, the development of varying requirements through the design and manufacturing stages and the results of subsequent operation by a variety of operators in various parts of the World. Prior to this, quite appreciable experience was obtained from Viking sales and operation, but considerable advancement, new problems and new techniques have prevailed during the Viscount era. The Viscount experience is probably unique in that the aircraft, being of such universal appeal, embraces not only about 40 regular airline operators, but also includes charter company, executive, V.I.P. passenger convertibles and military V.I.P. operations. This, together with advanced thoughts from operators, will be progressively manifest in new civil aircraft designs such as the Vanguard and Vickers V.C.10.

* Design Manager, Vickers-Armstrongs (Aircraft), Ltd., Weybridge.



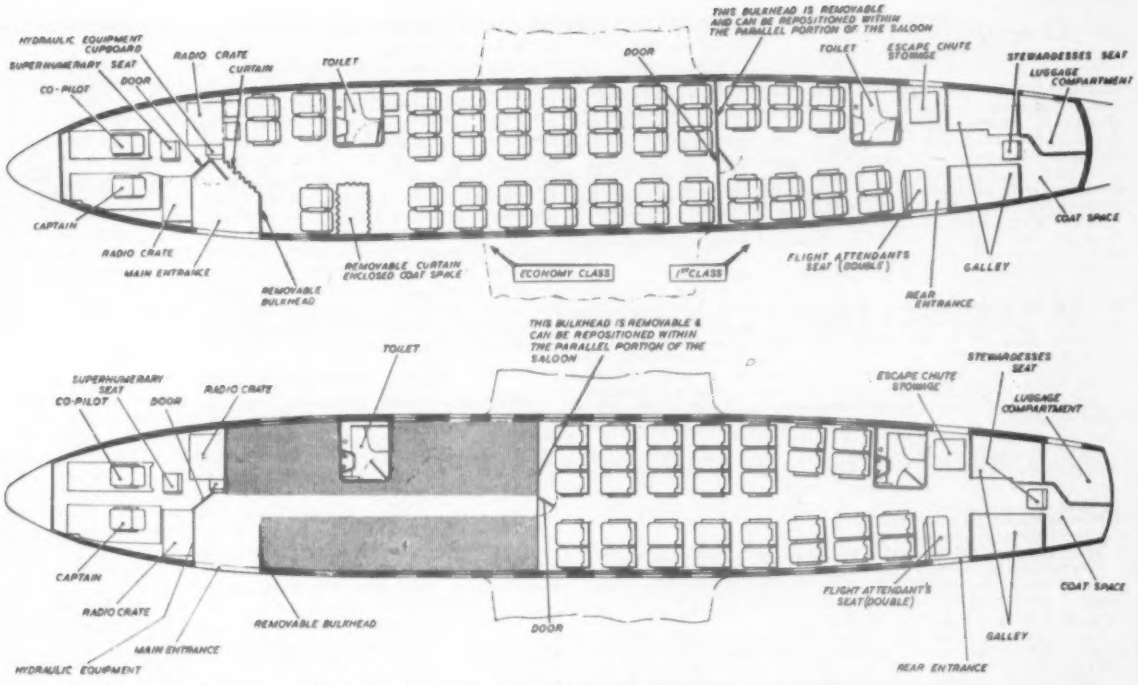
General Conception

The attempt is, therefore, to try to collate the problems in an order relative to the design of a modern airliner for which the basic airframe configuration has been established. Obviously there are certain points of passenger accommodation, comfort and service which will influence the basic design and reference will be made to the more important. The reader should also appreciate that however near the optimum the initial interior layout and design is, there will almost certainly be some rearrangement required at some time resulting from requirements to meet a different or additional operational rôle, or to suit a particularly valuable customer, who, incidentally, might introduce an improvement, of general application, over the optimum layout initially conceived.

A new design is obviously projected on the intended use and capacity of the aircraft and with the study and design required for range, performance, engineering, maintenance, systems, cockpit and crew layout and what is accepted as the general engineering, the interior accommodation takes its place as a most important section, serving the general day-to-day use of the aircraft in carrying people from A to B to C and so on. "Carrying people" is an under-statement—they must travel in safety and comfort, and should feel that the aircraft was furnished for their use and that particular attention was applied during the design towards this purpose.

Most hard-headed engineers have been apt to treat this section with a certain indifference, in that it is a follow-on and not requiring much ingenuity to fill the cabin with seats, toilets and galley equipment and some sort of lining to hide their wonderful structure. Even the seasoned traveller reacts favourably to good accommodation and a pleasant décor and good sound thinking can make the difference between a canteen and a good club atmosphere. Again, the soundness of this construction, with ease of dismantling whilst maintaining a

Above, and top left, are two views inside a K.L.M. Viscount showing typical modern design of a short-haul interior, and a galley unit. Left, the lounge in a Continental Airlines Viscount.



An illustration of the way in which the changes can be rung in a Viscount for, say, a charter operator. The top diagram shows a mixed-class layout and, below it, a mixed freight and economy-class layout.

good and clean finish, is the requirement of operators from the maintenance point of view.

It follows, not only from this as a practical approach, but also from the fact that operators have their own thoughts—and a deal of experience—on this subject, that appreciable influence can be asserted by the initial buyers of a new type. Two major points emerge:—

(i) The importance and correctness of the initial design becomes manifest in the discussions in that there is a sound and practical reason for everything and therefore less likelihood of changes.

(ii) Elimination of the possibility of the first production design and manufacture becoming unduly influenced by the insular ideas of one operator which may not accord with the rational requirements of subsequent operators.

When one considers that the percentage of design time for interior accommodation is of the order of 16% of the whole, i.e., 240,000 design man hours for an aircraft with a gross weight of about 300,000 lb., it is of paramount importance in the economics of manufacturing and selling the aircraft, particularly in estimating lead time and delivery, that the basic design is the preferred one. It is not intended to imply that operators' thoughts cannot be taken seriously; in fact, their practical experience can be invaluable, provided it is obtained at an early stage and is thoroughly appraised to avoid the introduction of requirements which do not contribute towards the general utility of the aircraft. Of course, cases can occur where an operator will insist on special requirements, but this can usually be associated with the fact that the designed layout cannot be proved better or that it is influenced by the requirement of a new operational rôle. For these cases, designed-in "flexibility" in the initial design is important.

The advised general approach therefore is:—

(i) A sound and comprehensive design study with an optimum layout and décor as the objective.

(ii) Recognition of operator requirements and passenger appeal.

(iii) Recognition of divers rôles demanding revision of parts of the layout and the ability to absorb such alternatives with the minimum effort, both in design and manufacture.

(iv) To obtain practical experience and advice on current and future operating conditions.

(v) To ensure that the design is controlled by a practical designer and team who can appreciate layout and décor with practical manufacture, maintenance, weight and cost control.

Essential with this thinking, and as an immediate follow up, is the provision and use of a full scale mock-up—the prototype or first aircraft is too late.

The designers must have the ability to demonstrate the results of their study, not only to prove details to themselves, but to have the ability to present and impress the large number of people, including customers, who cannot fully appreciate the general effect from drawings only—also to confound the critics by actual demonstration. This is a good insurance when compared with the alternative of correcting after production drawings have been completed, particularly when it is realized that the mock-up, already a "must" for other reasons, is having its use extended for this important aspect and ensuring that decisions and proving are obtained at the right time.

Specification

We reach the stage of a particular design specification which must be compiled to meet agreed requirements, whether formulated by the manufacturer or the customer, but in general practice a combination of the two. In these days of aircraft being ordered straight off the drawing board, the customer is inclined to exert considerable influence during the initial stages. This, of course, varies according to a particular airline's range of operation and also by the advent of larger aircraft with increased versatility over medium and long ranges. It is probable for a modern airliner, of the type to be seen in the near future, to have six alternative accommodation layouts specified to meet the wide route coverage and seasonal operations demanded. Without any stretch of the imagination, these could be economy, tourist, first cabin, standard first, luxury and mixed classes.

These alternatives are not achieved by merely changing and respacing seats, but also involve repositioning and variation of dividing bulkheads, toilets, buffets or galleys, lounges, sleeping berths, the introduction of liferafts and with all this a satisfactory installation of passenger individual services in the form of reading-lights, steward call lights and fresh-air louvres. The mixed class can resolve into almost any combinations of portions of the other five rôles.

This gives an insight, not only into the difficulties of engineering passenger accommodation, but of the problems associated with the basic structure and systems to accommodate the alternatives, particularly when it is appreciated that conversion of any aircraft to any alternative shall be possible without structural changes and within a limited time allowance.

As much of the detail of the accommodation can be taken for granted by the layman, it may be appropriate to list some typical requirements which would appear in the specification. Some stem directly from the required layouts, whilst others are requirements in their own right. For example:—

(i) Seat attachments shall provide for easy and rapid installation of seat units and shall provide unlimited fore and aft adjustment to conform with the various layouts.

(ii) Passenger seats usually have a specification to themselves.

Air Transport . . . .

At the risk of introducing a note of levity into this serious subject I will endeavour to cover with my own brief interpretation:—Design is required to give maximum comfort, to cater for postures for which the human body was not designed, to be foldable for passenger movement, collapsible for stowage, reclinable for relaxation, robust enough to withstand the most novel methods of abuse conceived, have no interfering structure between the hind legs, ability to take tables, belts, life-jackets, ashtrays and periodicals, to look good and to weigh not more than the least that cannot be afforded—and when it is made we shall probably not like it.

(iii) Provision for the installation of sleeping berths.

(iv) Cabin to be effectively soundproofed and thermally insulated by approved fire resistant materials with adequate protection against moisture absorption. Attachment to the structure shall be by non-conducting materials. Door handles, luggage rack supports, etc., to be thermally insulated from the structure. Transmission of structure-borne noise to be minimized.

(v) Cabin linings to permit ease of removal and replacement.

(vi) Solid type luggage racks throughout the length of the cabin with detachable portions in the way of and alternative to the sleeping berths.

(vii) Individual reading-lights, cold air outlets and cabin attendant's call buttons to be installed for each passenger seat and berth position. They shall permit of complete flexibility of fore and aft location along the cabin using universally adjustable units such that the variation of seating positions, required by the alternative layouts can be accommodated.

(viii) Provision to be made for the carriage of children's cots.

(ix) Magazine racks, self-service drinking-water points.

(x) Readily removable galley units for the preparation of pre-cooked frozen meals with quick disconnect points for all fluid and electrical services.

(xi) Provision for an optional readily removable bar unit.

(xii) Ability to convert portion of the cabin into a lounge (luxury class).

(xiii) Permanent and removable toilet compartments with flushing-type non-corrodible toilets. Washing, drinking and electric shaving facilities.

(xiv) Water system non-freezing, non-corrodible tanks and non-metallic pipes. Contents gauges, stop cocks and hot and cold water. System to be serviced from external charging points and completely drainable.

(xv) Cabin attendants' seats, call board and control, announcement facilities, crew intercommunication, cabin temperature control.

(xvi) Saloon lighting and illuminated signs usually carrying considerable detail in the electrical section.

(xvii) Miscellaneous passenger notices, usually bi-lingual.

(xviii) Emergency arrangements in addition to emergency exits, to be provided in full for emergency alighting on land or water, including emergency lighting, life-jackets, liferafts, flotation cots, evacuation chutes, escape ropes, emergency axes and First Aid equipment.

Whilst this list is by no means complete it gives a fair indication of domestic engineering problems to be resolved and the additional complexity of modern airliners, particularly in the field of maintenance and upkeep. In addition, it will be realized that the provision of these requirements will have some influence on the design of certain main components which do not come directly under the heading of passenger accommodation.

Basic Design

Apart from the main fuselage or pressure cabin structure, which is affected to a minor degree in regard to attachments, floor structures, pressure and air conditioning installation, electrical supplies, lighting, and soundproofing, installation of accessories needs careful planning to cater not only for a specific passenger accommodation but for a certain amount of flexibility in the design to meet alternatives, such as those mentioned previously, and, of course, any additional changes peculiar to other operators, which cannot to avoided.

I use the term "flexibility" to describe the form of design which provides for the ability to switch component parts such as toilet compartments, pantry units and passenger services, with their ancillary services, to suit different configurations with the minimum effect on the basic parts such as structure attachments, electrical wiring, air conditioning and domestic water systems, soundproofing, flooring and passenger seat fixing. Two particular examples which illustrate this are the provision of seat rails and sectional side panelling which provides for the interchange of plain panels and those embodying passenger service units controlling individual lights, cold air louvres and stewards call.

Even the drawing system can be adjusted to assist in this direction by the introduction of sub-components, all complete in themselves, and so confine the part redesign to the local feeder sections of the main components. Apart from a considerable reduction in design man-hours it contributes towards the elimination of additional tests and assists continuity of planning, ordering and manufacture in the production departments and so helps to maintain competitive costs and deliveries.

Changing policies of airlines, such as the introduction of economy or mixed class travel, can have a serious effect where a completed design has not catered for this possibility, and although this is currently a basic requirement it was not so obvious a possibility several years ago. There is no special magic in crowding seats close together, making them narrower and dispensing with lush galley and toilet units or repositioning them at opposite ends of the cabin, but it becomes a real and expensive problem if the air conditioning and electrical supplies cannot cope because there is insufficient in hand over the original design requirements. Even if the crystal ball does indicate a future possibility, there is the old tug-of-war of built-in weight, cost and possible complication against the firm requirements known at the time, and having solved this it can again be confounded by a subsequent demand for extra high-density passenger seating.

Interior Furnishing—Lining and Trim

Décor and colour technique tend to become the main theme of the lining and trim of the modern airliner and it has attracted a new vocation of interior stylists or designers. Airline competition has reached the pitch where "passenger appeal" is one of the few remaining things left on which the change can be rung and the sedate, restful and probably drab interiors which were familiar are now a thing of the past. Nevertheless, after the specialists have drawn up their crude requirements, it remains for the designers to resolve these into practical bits and pieces, keep weight under control and generally convert the conception into a useful part of the aeroplane rather than use the aeroplane as an exposition of the art of interior design. Here one meets minor but annoying problems in achieving good unbroken panel finish, adequately supported and detachable, but without the means of support being visible.

Interior Furnishing—Hardware

I do not propose to extend myself further on passenger seats except to record that there are a number of proprietary types to choose from, all of which are like the curate's egg—good in places; and my personal opinion is that this is better left to smaller firms who can study the subject and specialize in the design and manufacture.

Galley design has its own set of problems, the chief of which is the difficulty of standardization, either in the equipment, type of meals to be served or the size of the food tray. As an illustration, the difference in overall size of a meal tray could cause a redesign of a galley unit which was otherwise acceptable, e.g., the stowage of X number of meal trays ½-in. longer than a previous type will increase the overall size of the unit, which in turn can snowball into a number of complications.

Again, considerable quality control and economic use of space must be achieved. Usually, the operation manager classes it as a necessary evil, utilizing space which could be more profitably adapted for passengers. The catering manager considers he is never given sufficient space and the hostess loses her charming smile when she thinks of the aircraft design team which, she feels sure, is responsible for the lack of working room, equipment in wrong places, bumps on her elbows, ladders in her nylons and a shiny nose through trying to cope with it all.

Control of design to attain quality finish is important—not only must sharp edges be eliminated but it is advisable to obtain the rounded edge by forming or folding the material as distinct from radiused edges. Depressions, corners and, above all, lightening holes, should not be introduced as these are often hidden and not cleanable and therefore become collecting pockets for waste and muck. Substantial cabinet-retaining catches, foolproof and easily operated by one hand, are a firm requirement, as well as easily sliding cabinets, trays and containers. Smooth and joint-free working tops and overall lightness and robustness are essential. There are numerous points of this nature to observe and practical experience is necessary to produce a satisfactory design.

Toilet compartments, although less complicated, have their particular problems, especially in enabling the equipment to be positioned and used to the best advantage in the restricted space allowed. Flushing systems, non-corrodible materials, robust, foolproof working parts with a minimum of weight expended must be the aim of the design.

Water Systems

These are usually confined to washing and drinking facilities. Replenishment is from points accessible from the ground and suitable for standard equipment. Where possible, gravity feed to the taps is advised but this is not always possible and a

(Continued on page 693)

Only the VANGUARD

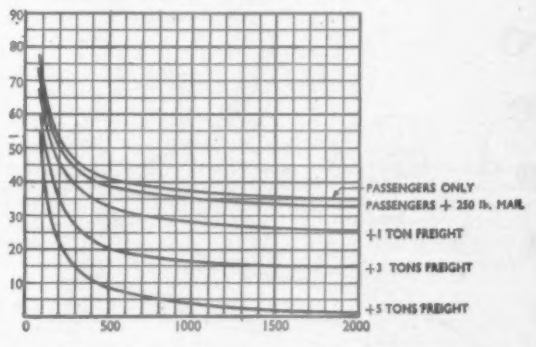
has this low-cost story

THE CONCLUSIONS to be drawn from this simple graph are among the most significant ever put to airline operators. It shows at a glance that the Vickers Vanguard will break even on total costs (indirect costs are taken as 100 per cent of direct) with passenger loads no higher than those actually carried by Viscounts today.

With three tons of freight the passenger break even requirement can be as low as 21 people falling to only 8 passengers when five tons of freight is carried for 500 miles. The Vanguard is a profitable aircraft on today's payloads yet it has room for the inevitable expansion of traffic which, even at a modest progress, makes the Vanguard the biggest potential money earner ever built.

In addition to its outstanding economy, the Vanguard is fully competitive in speed (425 m.p.h. cruise), and its turbo-prop flexibility will enable it to maintain schedules as good as any, while allowing for realistic traffic conditions.

BREAK EVEN NEED–CURRENT TOURIST RATE



BREAK EVEN NEED — PASSENGERS ONLY

500 MILE SECTOR

1 CLASS	31 PASSENGERS
TOURIST CLASS	39 PASSENGERS
*ECONOMY CLASS	49 PASSENGERS

*(20% Reduction of tourist)

Based on current European costs and revenues.

Of all the airliners only the Vanguard has all these features

425 m.p.h. cruising • Freight capacity 10 tons at normal densities • Full routeing and A.T.C. flexibility • Can use normal existing airfields • Quick turn-round • No airfield noise problems • Ten years' unique Vickers/Rolls-Royce turbo-prop experience . . . ***And it is 'Viscount' quiet.***

VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE TURBO-PROP ENGINES

• ***The airliner with the biggest profit potential ever offered to the operator***

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT624

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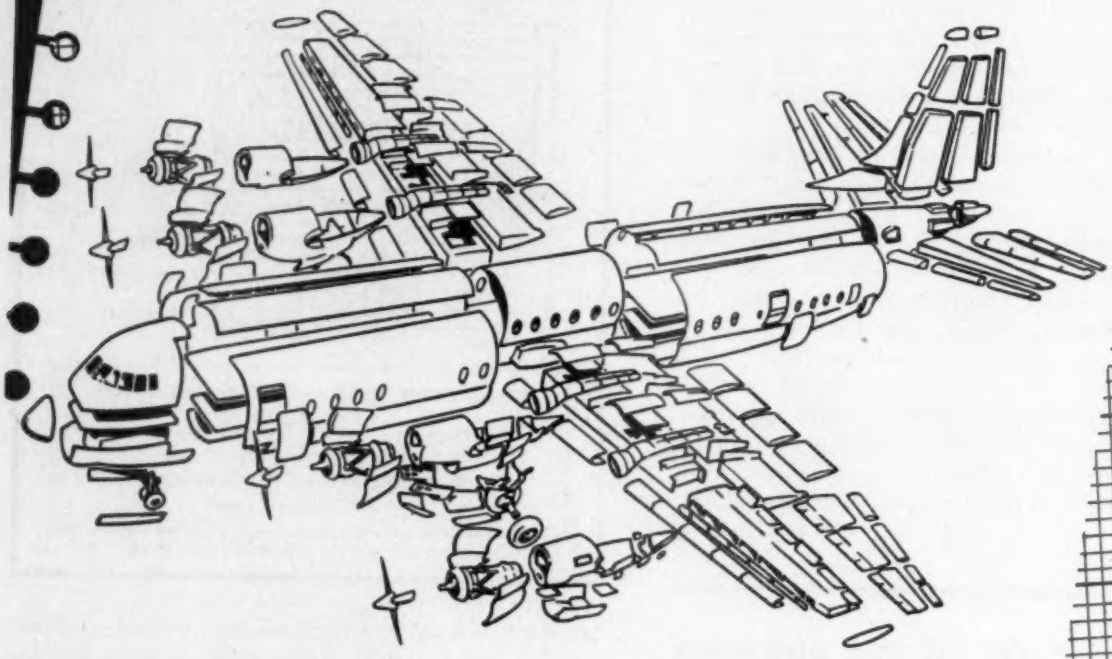
VANGUARD STRUCTURAL DRAWING



... and when it came
to Batteries
the choice was
DAGENITE

PETO AND RADFORD · 137 VICTORIA STREET · LONDON · SW1

PR30

Air Transport . . . .

(*Continued from page 692*)

pump system has to be introduced. Some operators insist on purifying units due to the varying and doubtful pick-up of water en route. Overboard drainage of waste water has its particular problems in siting and designing the outlet to avoid freezing and further to avoid contact between the expelled water and the fuselage skin, as considerable ice build-up will occur if this condition is obtained.

Apart from general lighting, magazine racks and that most necessary of services, the bar box, there are the individual reading lights, cold air louvres and call buttons. These do not offer any particular problem for a standard seating arrangement, but when there is a combination of alternatives to cater for it is rather a different matter, calling for considerable ingenuity in providing a satisfactory solution, particularly as this is usually regulated by the time it takes to move the seats around. Decor and styling must be maintained, switches and adjustable louvres must be within easy reach but must not protrude or be in such a position as to cause injury due to inadvertent movement by the passengers.

Noise-producing accessories have a distinct bearing on passenger comfort. With the current improvements resulting in reduction of engine noise and soundproofing of cabins, odd noises from small electric motors and similar equipment can achieve a prominence not recognized in the past when these ancillaries were drowned in the racket usually obtained from the piston engine.

The obvious position to accord with the requirements of the relevant system and the convenience of space and accessibility can be the worst for producing a screech or whine penetrating into the cabin. This is not only a passenger nuisance but can be the cause of uneasiness to the inexperienced traveller. Attempted soundproofing is usually a poor remedy, being expensive in weight, comparatively poor in response and sometimes impracticable or at least too complicated where efficient cooling of the accessory is necessary. The best remedy, although it will raise problems of varying degree, is to position such units to the best advantage but consistent with maintaining an efficient system, in areas where the noise will either not be heard or be adequately muted.

Adequate baggage holds with appropriate lashing, ease and quickness in loading and unloading are ancillary essentials to the passenger accommodation. Wardrobes and carry-on luggage compartments are somewhat influenced by the type of operation, but whenever possible coat hanging accommodation is required. These are not particular problems in themselves, once it has been decided they can be provided without loss of fare-paying space.

Many readers will have had experience of the numerous little difficulties I have attempted to describe and will appreciate that the subject is far from exhausted. I have tried to produce typical cases, perhaps more to give some understanding to the reader who is not experienced in this phase of the design. It should also be appreciated that this is only one phase of equipment design and that others such as radio, radar, electrical installations and cockpit presentation each present additional and peculiar complications.

The Vickers Sales Technique

ALTHOUGH the Viscount is still a "selling aeroplane" and Vickers-Armstrongs (Aircraft) are keeping up the pressure to interest both old and new customers in the World's most successful turboprop transport, much of the effort at Weybridge has now been switched, naturally enough, to selling the Vanguard. For this aeroplane, the company has perfected a sales presentation technique which is one of the most comprehensive and effective yet devised by a British manufacturer.

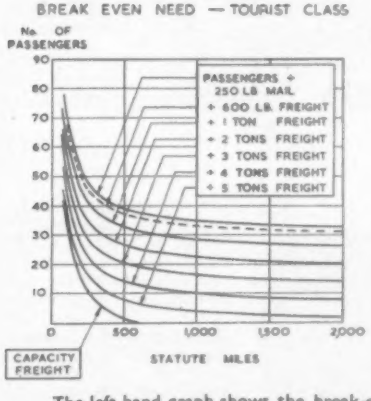
This presentation—which is only one part of a continuing sales promotion campaign developed for each prospective customer—is the work of a Vickers team, and is designed to extend over a whole day. Whenever possible, the aircraft itself visits the local airport next day, and this has already been done with the Vanguard at Hamburg, Brussels and Rome.

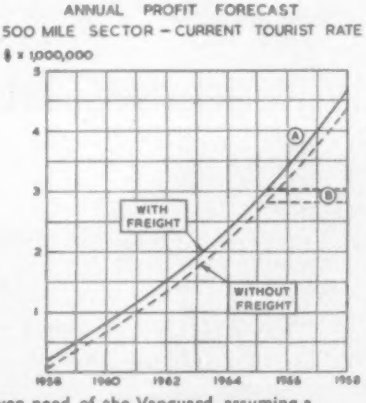
To open the morning's programme, an introductory talk is given to stress Vickers' "simple belief" that the turboprop transport is not just a "poor-man's jet" but is a transport aeroplane in its own right and is the only logical aeroplane for the short- and short-medium haul routes. This part of the proceedings—which sometimes gets called "the purple patch"—is necessarily concerned with opinions rather than facts. For the rest of the day, the material presented is entirely factual, and it is Vickers' boast that every fact and figure can be fully substantiated.

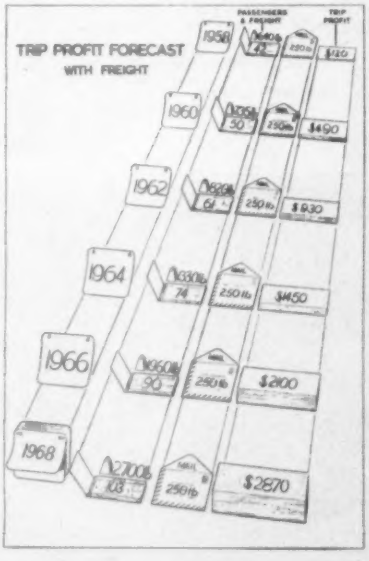
A film of some operational and engineering aspects of the Vanguard has recently been completed. After this has been screened, a five-minute engineering summary is given, for the benefit of any airline personnel unable to attend a full engineering briefing in the afternoon. The remainder of the morning is taken up by a detailed survey of the aircraft applied to the particular airline's route network. This survey is prepared by the Civil Aircraft Development Group, one of whose members usually presents the results.

In the afternoon, the engineering is examined in detail, and finally a flight test report is given by one of the test pilots or a senior member of the flight test department at Wisley. As noted already, the presentation is rounded off, whenever possible, by a visit by the aircraft for examination and—as soon as a restricted C. of A. has been obtained—for demonstration flights. The whole presentation is, of course, supported by all the necessary literature.

Reproduced on this page are three illustrations typical of those used in the sales presentation to support the claim that the Vanguard is "the most economical and profitable short- and medium-range airliner on offer in the World today."







The left-hand graph shows the break-even need of the Vanguard, assuming a passenger revenue rate of 8 cents/seat-mile and a freight revenue of 50 cents/ton-mile. The annual profit forecast, centre, also assumes current tourist fares and growth rates of 10% and 7% respectively for passengers and freight. On the right is the profit which can be made on a single 500-mile trip, assuming the same annual growth rates.

R.A.F. Nuclear Power in Germany

IN the 1957 defence White Paper, which called for the drastic reorganization of British military forces, the operational strength of the R.A.F. in Germany was scheduled to be cut by half, and at the same time greatly increased in striking power by receiving a nuclear capability. The reduction in size, which has been given rather too much prominence compared with the additional potency, was completed in September last year. The second part of the programme, in the words of the C.-in-C. of R.A.F. Germany and the N.A.T.O. Second Allied Tactical Air Force, Air Marshal Sir Humphrey Edwardes Jones, K.C.B., C.B.E., D.F.C., A.F.C., B.A., is "very near to completion."

This reorganization has been accompanied by major changes in structure and tactics, reflected in the official redesignation of 2nd T.A.F. as R.A.F. Germany, from January 1 this year, with an A.O.C., Air Vice-Marshal W. J. Crisham, C.B., C.B.E., to assist the C.-in-C. The former Nos. 83 and 2 Groups of 2nd T.A.F. have also given place to Nos. 1 and 2 Tactical Operations Centres (T.O.C.s) at Goch and Sundern, for the organization of the Allied tactical air elements in N.W. Germany, while the few day-fighter squadrons operate through Joint Combined Operations Centres and Sector Operations Centres (S.O.C.s).

Changes in tactics have been mostly tailored by considerations of guided missile and nuclear weapon potentialities in a limited war, for which R.A.F. Germany is primarily prepared. On the assumption that few tactical aircraft could survive at high altitudes because of enemy surface-to-air missiles, the Command has changed to a principally low-level rôle, which brings with it a number of interesting new techniques, in addition to quite a few problems.

Another change concerns the mobility of R.A.F. Germany, which as 2nd T.A.F. had a brilliant record of field operations dating from the latter days of World War II. There is now much less emphasis on this aspect of the R.A.F. task in Germany because of the dependence on very powerful, and therefore large and immobile, radar stations forming part of the N.A.T.O. early-warning and control chain stretching from Norway to Turkey.

Modern jet aircraft are also unsuited to field operations without large spares and maintenance backing. However, a divergent viewpoint is being explored in the N.A.T.O. lightweight strike fighter concept.

The reduced establishment of R.A.F. squadrons in Germany is concentrated on only a half-dozen or so stations built out of Occupation costs, many of the former bases having been handed over to the Federal German Luftwaffe. This force is due to take over many of the tasks at present performed by the R.A.F. in Germany, and particularly the air defence rôle, but the Luftwaffe has fallen well behind its planned schedule of expansion, and British responsibility will remain unchanged for some considerable time to come.

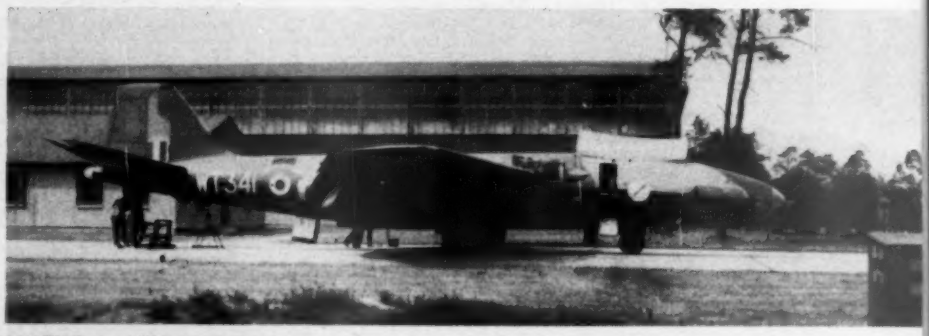
The main strike and reconnaissance component of R.A.F. Germany is based West of the Rhine on the so-called "clutch" airfields of Geilenkirchen, Brüggen, Wildenrath and Laarbruch grouped in close proximity to the Dutch border, and near the Command and Allied headquarters at München-Gladbach. This long-range element placed well back from the Iron Curtain is principally comprised of Canberras for light bomber-interdiction and photographic-reconnaissance duties, but also includes the all-weather and night fighter squadrons of R.A.F. Germany, with Meteors, Venoms and Javelins.

When the nuclear capability of the Canberra force is complete, it will be one of the most powerful of N.A.T.O.-assigned tactical units in Europe. With Canberra B.(I)6s and 8s, the atomic strike force will be capable of toss-bombing, with the aid of the American LABS (low-altitude bombing system) equipment, which computes the correct approach path to the target, and facilitates the subsequent roll-off-the-top manœuvre to return on a reciprocal course and escape the blast of the exploding weapon. The interdictor Canberras also operate in the armed-reconnaissance rôle, with conventional high-explosive bombs and their four 20-mm. ventral cannon.

Reconnaissance is considered one of the most vital of the many tasks required of the R.A.F. in Germany, and over medium ranges is continuing to be undertaken by Canberra P.R.7s. These, however, have had their squadrons distributed among the "clutch" bases instead of being concentrated on one airfield, as in the past, and are now also concentrating on low-level training for their war rôle.

All low-altitude jet operations demand an extremely high standard of training, and high-speed navigation to find pinpoint targets can be performed accurately only after extensive map-reading practice, since no external aids are available at the moment. Both the strike and reconnaissance Canberras are

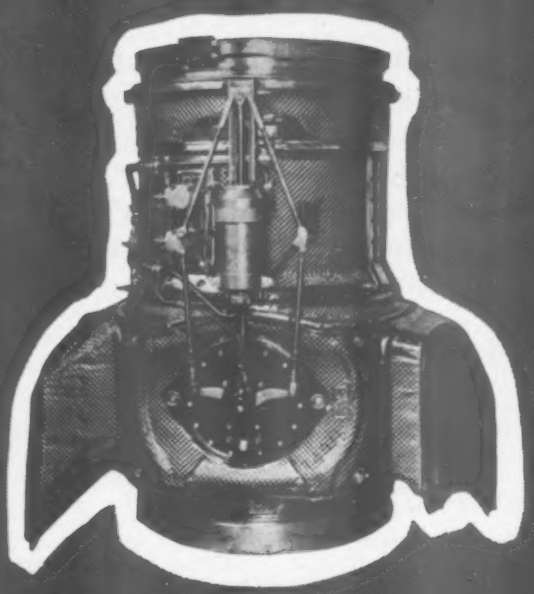
(*Continued on page 695*)



Right, fulfilling both armed-reconnaissance and atomic strike roles, the Canberra B.(I)8s of R.A.F. Germany form the main N.A.T.O. punch in North-Western Europe. Cockpit temperatures in summer have proved rather high on the ground, so the Canberras of No. 16 Squadron at Laarbruch wear sunshades at dispersal.

Photographs copyright "The Aeroplane and Astronautics"

Left, although greatly reduced in size, the day-fighter element of R.A.F. Germany still has the responsibility for the air defence of the northern N.A.T.O. area, and for patrolling the Air Defence Identification Zone alongside the Iron Curtain. These Hunter 6s are from No. 20 Squadron at Gütersloh.



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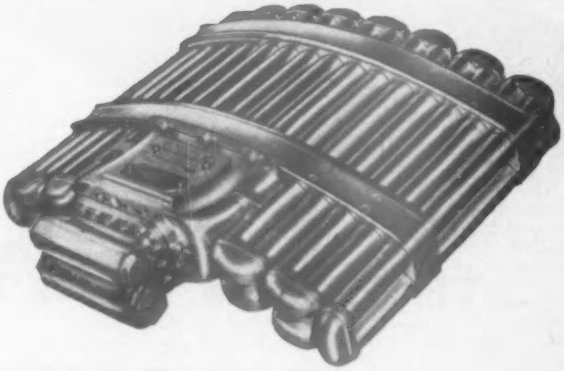

Heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Vanguard's anti-icing system. Similar units are being supplied for the Fokker Friendship, the Bristol Britannia, the Armstrong Whitworth Argosy, the Vickers Viscount and the Handley Page Herald.

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(*Continued from page 694*)

due for replacement in 1965 by the supersonic Vickers/English Electric T.S.R. 2, which is to have an all-altitude capability.

Short-range reconnaissance in Germany is undertaken from the two advanced R.A.F. bases at Gütersloh and Jever by the only operational Swifts in service. With its nose-mounted cameras, and afterburning Avon engine, the Swift F.R.5 has proved extremely useful for the exacting demands of fighter-reconnaissance, which involves flying most of the time below 250 ft. and above 450 knots.

Airframe fatigue under these strenuous conditions has proved less for the Swift than was anticipated. But a strengthening programme within the Command has greatly extended the potential life of the aircraft.

The forward bases in Germany also house the Hunter 6 day-fighter squadrons of the Command. With the all-weather units, their main job is to investigate unidentified aircraft detected in the northern sector of the Air Defence Identification Zone (ADIZ), which extends along the border of Eastern Germany and Czechoslovakia. Special flight plans must be filed to enter the ADIZ, and unscheduled aircraft detected by the early warning radar are promptly intercepted by fully armed Hunters of the duty "battle-flight."

The squadrons maintain a weekly "battle-flight" on a rotational basis, at five-minutes' readiness, backed up by further Hunters on 30-minutes' call. During the hours of darkness, the all-weather squadrons at the "clutch" bases take over this duty. Two of these units have Gloster Javelin 1s, 4s and 5s, and the remainder are due for re-equipment some time this year.

Future status of the day-fighter squadrons in Germany, which were the main targets for the White Paper reductions, is less positive than that of the strike element, and is largely dependent on Luftwaffe progress. If the R.A.F. day-fighter squadrons remain in Germany for some time to come, replacement of the Hunters by English Electric Lightnings would be logical, but although A.T.A.F. defence is being augmented by air force-operated Nike surface-to-air missiles in Belgium, Germany and the Netherlands, manned fighters are considered essential for the positive identification of ADIZ intruders.

As one of the major components of Allied Air Forces Central Europe, and fully assigned to N.A.T.O.'s Supreme Commander, General Norstad, R.A.F. Germany is capable of going to war, according to its C.-in-C., "at the drop of a hat," and handling with its present equipment anything likely to be presented by its potential enemies. Although the massive airfield at Gatow is one of its responsibilities, on a care and maintenance basis, the motto of R.A.F. Germany since the Berlin ultimatum has been "business as usual."

Gatow is quite capable of reverting to its 24-hour airlift operation if required although, at the moment, its 250 personnel account for only a small percentage of the 13,000 or so in R.A.F. Germany. Of these, about 1,500 are officers, and some 10% National Service men, while additional R.A.F. personnel comprise about 25% of the Second A.T.A.F. staff. No figures of aircraft strength are publishable, but it has been stated that there is no great disproportion between the Communist fleets of some 1,200 machines in E. Germany, Czechoslovakia and Poland and those of N.A.T.O. on the Continent.—J.E.F.

A Reconnaissance Victory

FOR the third year in succession, British, Belgian and Dutch aircrews of the 2nd Allied Tactical Air Force beat American and French personnel of 4th A.T.A.F. in the annual reconnaissance competition of Allied Air Forces Central Europe. This was held at Eindhoven, in the Netherlands, where in two days of intensive operations, between June 2-5, each crew flew four reconnaissance sorties against targets in Western Europe within a 400 nautical mile radius of their base.

Four teams, each with two aircraft plus a reserve, took part from each A.T.A.F., and the teams also provided their own photographic processing and interpreting facilities. The 2nd A.T.A.F. teams comprised R.A.F. Canberra P.R.7s and Swift F.R.5s, and Belgian and Dutch RF-84F Thunderflashes, while from 4th A.T.A.F. came U.S.A.F. RF-101 Voodoos (two teams), RB-66B Destroyers, and French RF-84Fs.

The U.S.A.F. types, and particularly the supersonic Voodoos, were newcomers to the "Royal Flush" reconnaissance competitions, and their high speed conferred considerable advantages to 4th A.T.A.F. in certain aspects of the contest. Thirty per cent. of the total points were awarded for the speed with which missions were completed, while the remainder were acquired for accuracy and proficiency of the photographic intelligence produced by the combined efforts of ground and aircrews.

For the competition, reference folders of previously selected targets were handed to pilots or crews by the AIRCENT umpires, who began timing them from that moment, while they conducted their pre-flight planning, until their aircraft began taxi-ing. Timing was then interrupted to avoid excessively fast taxi-ing, and resumed at the start of take-off. It followed a similar procedure for landing, and ceased after the camera magazines had been unloaded and processed. Interpretation and final assessment times were also judged in the competition.

An example of the speed achieved in "Royal Flush IV" was provided by the Voodoo squadron commander, who began taxi-ing within three minutes of receiving his target folder, and was back over Eindhoven after photographing targets at Beccles, Norfolk, within 34 minutes. Heights were left to the discretion of the pilots, but two bands were laid down of either below 800 or above 30,000 ft. The Voodoos frequently flew supersonically below the former height, and many broken windows were reported during the competition.

With their three-man crews, the R.A.F. Canberras achieved even more startling "scramble" times, one starting up and beginning to taxi within 29 seconds of one of the navigators being given the target folder. The Canberras scored the highest points in the competition, being the only aircraft to find one of the most difficult targets, but the Swifts were placed first in overall position on a percentage formula for the targets.

The top-scoring Swift pilots from No. 79 Squadron were Flt. Lts. A. M. Cobban and J. H. Turner, while the leading Canberra crew, from No. 80 Squadron, comprised Flt. Lt. B. A. Stead, Plt. Off. P. Hicks and Flt. Sgt. C. Payne.

With a clear lead of over 1,000 points, gained through finding and photographing all the targets on the single pass allowed for each, 2nd A.T.A.F. were therefore awarded the Gruenther Trophy by H.R.H. Prince Bernhard of the Netherlands at Eindhoven on June 5. All the 2nd A.T.A.F. teams were placed higher than their competitors despite the considerably more modern equipment of the U.S.A.F., but probably because of the higher speeds, 4th A.T.A.F. missed several targets. J.E.F.

Photographs copyright "The Aeroplane and Astronautics"

Above, top-scoring Swift pilots Flt. Lts. J. H. Turner and A. M. Cobban in "Royal Flush IV" are seen here with their interpretation and processing team-mates, Flt. Lt. Flaxman and Flg. Off. Lockwood. Right, No. 79 Sqn.'s Swifts are normally based at Gütersloh.

A Lightning Made for Two

AHEAD of schedule, the two-seat English Electric Lightning first flew on May 6 and went supersonic during its maiden flight. This new aircraft has been ordered as an operational trainer by the Royal Air Force.

Performance details of this trainer are secret, but deductions about it can be based on an external examination, which suggests that only the nose section of its fuselage differs from the standard single-seat Lightning. For ease of production the nose fuselages of the single-seat and two-seat Lightning are probably interchangeable at the point, about 3 ft. 9 in. behind the leading edge, where they join the centre fuselage. Behind this point the only difference appears to be the larger spine fairing on the trainer.

The nose fuselage of the two-seater is the same length as that of the single-seater and, below a horizontal line through the intake bullet, it appears to be identical in shape. This makes sense, as it allows the trainer to have the same nosewheel and armament bays and lower-gun installation as on the single-seater.

Above its centre-line the nose-fuselage of the trainer is bulged out, giving a characteristic "hollow-cheeked" appearance, and providing the increased width necessary for a cockpit with side-by-side seating. The large canopy has a more elegant appearance than that of the single-seater; its windscreen is slightly more inclined and the spine fairing behind the cockpit converges more gradually both in plan and elevation.

This gives the aircraft a better appearance than the single-seater, although it was no doubt designed with area-rule rather than æsthetic considerations in mind. The Lightning, incidentally, conforms to the supersonic area-rule, and has an area distribution giving the best performance at a Mach number above 1—the precise Mach number chosen is secret.

As an operational trainer the two-seat Lightning will have 30-mm. cannon, Firestreak air-to-air missiles and unguided rocket armament as on the standard fighter, and will retain its Airpass fire-control and other electronic systems. The only externally obvious change in armament appears to be the omission of the upper 30-mm. cannon, no ports for which can be seen on the trainer.

Elimination of two cannon must give an appreciable weight saving to set against the increased weight of the larger cockpit and canopy, as well as the weight of additional instruments, controls and an ejector seat. On balance the two-seat aircraft probably has an all-up weight very close to that of the single-seater.

The performance of the two-seater will inevitably be slightly lower because of its increased frontal area. Another limiting factor may be stability in yaw at supersonic speed; the single-seater has probably run into difficulties of this kind during its development for its fin is about 30% greater in area than the one originally installed. With the trainer's increased side area ahead of the C.G., it will possibly need an even bigger fin if it is not to be troubled at a lower speed than the single-seater by excessive sideslip and inertia couplings in roll.

Although announced as a trainer, the two-seat Lightning could well become an operational aircraft in its own right. This might happen if the advanced electronic equipment being developed for the Lightning made it advisable for a radar operator as well as the pilot to be carried.

Future development of the Lightning airframe is probably limited by kinetic-heating considerations; this makes it advisable to extend the effectiveness of the overall weapon system by improving the performance of the missiles carried and of their fire-control equipment. This trend can be seen in the current development of more advanced air-to-air missiles.

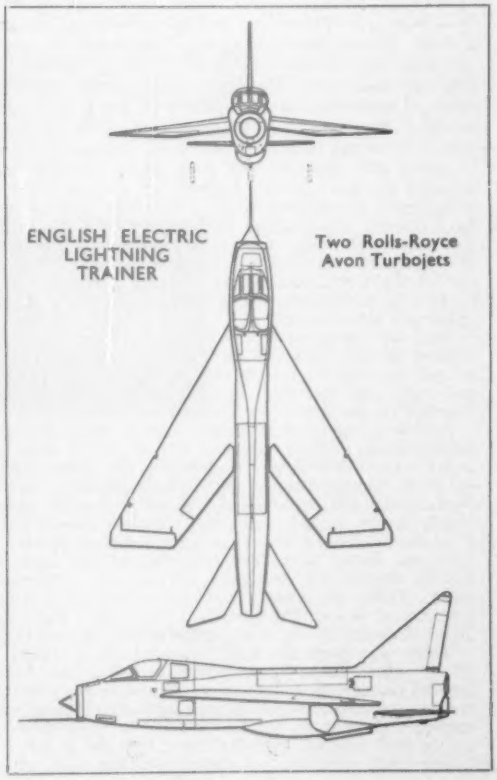
A two-seat Lightning carrying improved radar and advanced air-to-air missiles with nuclear warheads could well be a logical development for Britain's air defence. Certainly a two-seat aircraft would be ideal for carrying electronic counter-measure equipment.—J.R.C.

NEAR TWINS.—Below, cockpit and canopy lines of the trainer and single-seat Lightnings can be compared in this view of the aircraft at Warton aerodrome.

ALMOST AS FAST.—A almost as g

ROOM FOR A VIEW.—Seen head-on, the two-seat Lightning's "hollow-cheeked" appearance is emphasized. Pilots sit side-by-side and have a better field of view than from the single-seater.

ve, despite its greater frontal area, the two-seat Lightning is expected to have d a level speed performance as its single-seat Mach-2 counterpart.



The Fighting Services

Carrier Radar Demonstrations

ACCOMPANIED by ships of the Fifth Frigate Squadron, H.M.S. "Victorious" is to pay a series of visits to the United States, where an air defence demonstration will be held off Norfolk, Virginia, to highlight the capabilities of the Royal Navy's latest radar.

U.S. Navy observers are to embark in "Victorious" on July 21 to see the operation of the carrier's air warning and aircraft control radar, and associated semi-automatic data processing equipment. The radar, known as Type 984, is a "three-dimensional" system, which provides simultaneous information on the height, range and bearing of aircraft contacts. Matched with this high capacity comprehensive display system, a more complete and readily understandable picture of the air situation around the carrier is provided than ever before.

During the demonstrations in American waters the carrier's Scimitars and Sea Venoms will be augmented by U.S. shore-based aircraft. Leaving Norfolk on July 22, "Victorious" will return to Portsmouth on August 10.

R.A.A.F. Transport Changes

SCHEDULED C-130 Hercules freight services modelled on R.A.F. Transport Command lines are being established by the R.A.A.F. through major Australian centres and to Malaya. The Hercules will replace the previous Dakota courier services which have operated regular services plus many special flights within Australia for a number of years.

Trial schedules, subject to rearrangement after three months, are to be run through major R.A.A.F. bases on the Australian east coast from Laverton, Victoria, to Townsville, Queensland, every fortnight. Six-weekly services will be operated from Richmond, N.S.W., through Victoria and South Australia to Pearce, West Australia, from Laverton up the east coast and through to Darwin, and from Richmond through Darwin to Butterworth, Malaya. The services will carry freight for all the armed forces. Passengers will only be carried to make up loads.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. J. C. Hutton, D.F.C., to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. R. L. S. Coulson to R.A.F. Cottesmore to command the Administrative Wing.

Fighter Command: Gp. Capt. H. A. C. Bird-Wilson, D.S.O., D.F.C., A.F.C., to R.A.F. Coltishall to command; Sqn. Ldr. D. F. M. Browne, A.F.C., to R.A.F. Middleton St. George to command the Flying Wing (with acting rank of Wg. Cdr.).

Transport Command: Sqn. Ldr. C. R. Johnson, A.F.C., to R.A.F. Colerne to command the Flying Wing, with acting rank of Wg. Cdr.; Sqn. Ldr. E. W. Talbot, D.F.C., to Headquarters for Transport Support duties (with acting rank of Wg. Cdr.).

Flying Training Command: Sqn. Ldr. K. Lister, D.F.C., to R.A.F. Linton-on-Ouse as Chief Instructor (with acting rank of Wg. Cdr.).

Technical Training Command: Wg. Cdr. G. E. Horne to No. 2 School of Technical Training, Cosford, to command No. 2 Wing; Wg. Cdr. F. W. T. Pryer, O.B.E., to R.A.F. Uxbridge as Deputy Officer Commanding.

Maintenance Command: Wg. Cdr. H. B. Scully to Headquarters for equipment duties.

R.A.F. Germany (2nd T.A.F.): Sqn. Ldr. G. G. Masters to Headquarters for Control and Reporting duties, with acting rank of Wg. Cdr.

Other Appointments: Wg. Cdr. F. W. Morgan, M.B.E., to No. 131 Maintenance Unit, Aden, to command; Sqn. Ldr. G. W. Turner, D.F.M., to Christmas Island to command the Administrative Wing (with acting rank of Wg. Cdr.).

R.A.F.A. and the Service Spirit

THERE'S that old adage about the British character: "It's a nice day—let's go out and kill something." A better and, I think, a truer one, would be: "Whatever the day, let's go out and help somebody." And if, in the process, you also help and enjoy yourself, then so much the better. This British spirit of service is seen at its best in the R.A.F. Association, whose "Air Week" at Brighton concluded on Sunday last, June 7, with the customary two days' Annual Conference.

About 400 delegates and their wives, families and friends enjoyed the Association's biggest-ever project. The eight-day programme of fun and business had been opened on May 30 by Prince Bernhard of the Netherlands, who also attended that day's splendid flying display at Shoreham. The presence of Air Marshal Sir Geoffrey Tuttle, D.C.A.S., at the Display and at the Conference as Air Council representative, demonstrated the continuing official appreciation of the organization's value and importance.

That the "spirit of service" remains strong at all levels was evident by the presence on the Conference platform of 11 retired Air Officers among the 40 National Council members and Area and Overseas representatives, led by the president, Marshal of the Royal Air Force Lord Tedder.

Following the air display, the week of revels included a film premiere, an athletic meeting, air-sea rescue demonstrations, R.A.F. static exhibitions and police dog displays, fireworks, sea front illuminations by the Army, a celebrity concert, Royal Netherlands Air Force Band marching displays and a Tattoo which, on its second night, was almost drowned out by rain. "Johnny" Johnson, the Association's deputy general secretary, who was Tattoo arena marshal, realized that night that such a show depends for its success on a capable and stout-hearted band. Under the cheerful direction of the R.A.F.'s Organizing Director of Music, Wg. Cdr. A. E. "George" Sims, the Central Band, drenched to the skin, soldiered on and saw it through.

There was even the final judgment for a "Miss R.A.F.A. 1959" when, from 12 attractive area finalists, Scotland and Ireland emerged first and second. When, in reply to the diction-testing question "What is your ambition?" one young lady replied, "I want to see the World," a voice from the body of the hall advised, with feeling: "Join the R.A.F."

The final week-end included a reception by Lord and Lady Tedder. At this function there were Herr Gerd Brinkmann, general secretary of the V.D.K. (Federation of War Disabled, Widows and Orphans) with 1¼ million membership, and Herr Heinrich Scholz, of the National Council of the 700,000-strong Reichsband, a similar organization. The V.D.K. had been hosts, at their Bad Godesberg Conference last September, to an R.A.F.A. representative and on this, the first German visit to the Conference, the two organizations presented to Lord Tedder, for the Association, two fine porcelain gifts, one a bear, the old symbol of the City of Berlin, the other a bell of freedom.

At the Conference the great assembly gave an ovation to Dame Helen Gwynne-Vaughan, who is retiring from the chairmanship of the Executive Committee, and to Air Marshal Sir Robert Saundby, who has retired from the chairmanship of the National Council. Both have been elected Life Vice-Presidents. New members of the National Council are Air Marshal Sir Hugh Pughe Lloyd and Councillor T. N. Barling, president of the very active Brighton and Hove Branch.

Conference resolutions were fewer in number this year and business was brisk. Concern over the contraction of the aircraft industry was reflected in the Cheltenham Branch's successful resolution, put forward by its vice-president, Jack Bennett, C.F.I., Cotswold Aero Club, asking the National Council to give immediate consideration to augmenting the employment services of the Association to help members in their search for new jobs.

Resolutions calling for improved and fairer pensions were unanimously approved, as was one asking the Association to press for a Meritorious Service Medal to be awarded, as in the Army, with the annuity for long and meritorious service.

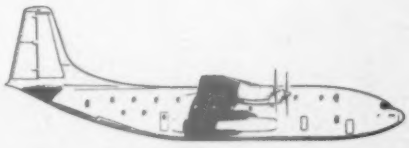
And along with the entertainment and the striving for a better World, there goes the British love of a parade, if it's not too regimental, and a sense of dedication, two characteristics seen at their best in the Association's Memorial Service and Parade when the delegates with Standards flying and medals displayed, marched to Brunswick Lawns. The Venerable F. W. Cocks, Chaplain-in-Chief, R.A.F., conducted the service which includes the Remembrance, when Laurence Binyon's moving lines were spoken by the Chaplain, the last line being repeated by the assembly, with Standards dipped to a drum roll: "We will remember them . . ."—WREN.

PROP-JET ECONOMY

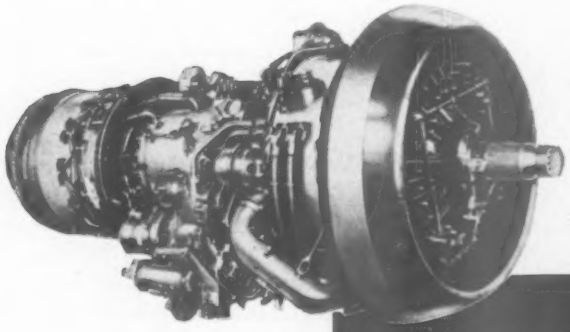
Backed by the unique experience gained by Rolls-Royce from over 7,000,000 hours' operation of their gas turbines in scheduled airline service, the Tyne has been designed to give the high powers with low fuel consumption demanded for new aircraft. It is due to enter airline service in 1960 at ratings of 4,985, 5,545 and 5,730 e.h.p. The Rolls-Royce Tyne powers the Vickers Vanguards ordered by British European Airways and Trans-Canada Air Lines and has been chosen to power the Canadair CL44's for the Royal Canadian Air Force, the Short Britannic 3's for the Royal Air Force and the Fairey Rotodynes ordered by New York Airways.

VICKERS VANGUARD

CANADAIR CL-44



SHORT SC.5 BRITANNIC 3



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The complete Leader Cable Equipment for a British Automatic Landing System will be Displayed on Stand No 109B at the Salon Aéronautique, Le Bourget, June 12-21

The leader cable equipment for a British Automatic Landing System recently successfully demonstrated at the Blind Landing Experimental Unit of the Royal Aircraft Establishment, was developed by Murphy Radio Limited in conjunction with the B.L.E.U. It is designed to land an aircraft under zero-zero conditions with a high degree of accuracy and reliability. We shall be pleased to receive visitors at our stand and discuss this equipment or any other items in the complete range which we are exhibiting.

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ASTRONAUTICS and MISSILES

Kenneth Gatland describes

A Multi-stage Rocket for Space Research

WITHIN the coming months, the United States is expected to make initial trials of a multi-stage rocket that could play an important part in Britain's plans for space-research. This vehicle, the Chance Vought Scout, is designed to meet several objectives: to place a payload of 150 lb. in orbit at 300 miles; to orbit 100 lb. at 500 miles; or, in the guise of a vertical probe, to lift 50 lb. payloads a distance of 7,000 miles from the Earth.

British interest in the project was confirmed to the writer by Professor H. S. W. Massey at the Press conference held on May 12 at Church House, Westminster, to explain the Government's intentions in space-research (THE AEROPLANE AND ASTRONAUTICS, May 22, 1959, p. 589).

Experience with X-17

Development of the Scout, begun earlier this year at the instigation of the National Aeronautics and Space Administration, followed suggestions that existing solid-propellent motors, if suitably staged, could provide an economical means of launching small artificial satellites and space-probes. This proposal had immediate appeal in view of experience previously acquired with such vehicles as the Lockheed X-17.

This most reliable and versatile solid-propellent step rocket had exceeded Mach 10.0 and provided data vital to the development of the nose cone and re-entry body of the Polaris. It was, in fact, the first U.S. test-vehicle to penetrate the ionosphere and return a nose cone through the Earth's atmosphere, and there is not one U.S. long-range ballistic missile that has not profited, in some way, from its development.

In August and September last year, on three occasions the X-17 carried nuclear warheads 300 miles above the Atlantic in tests carried out under Project Argus. Launchings were made from the U.S.S. "Norton Sound," a converted seaplane tender, and NASA are now reported to be investigating the possibility of launching satellite rockets from a ship as an alternative to the construction of an island launching base.

The idea of shipboard rocket launching is not new. On September 6, 1947, a V-2 rocket was fired from the flight deck of the aircraft carrier U.S.S. "Midway" in the Caribbean, and in 1949 three Aerobee rockets, instrumented to study cosmic rays at the geomagnetic equator, ascended from the "Norton Sound" at a point 600 miles west of Peru. Then, on May 11, 1950, Viking No. 4 was launched from the same vessel near Christmas Island in the Pacific, reaching a record height of 105 miles.

Whether or not the Scout will have at least trial firings at sea remains to be seen but clearly the elimination of complex pre-launch checks associated with liquid propellent rockets, and the storage and handling of the liquids themselves, would greatly facilitate the operation of a floating base, providing it was a sufficiently stable platform.

From a reliability viewpoint, solid propellent rockets have an excellent record. At a time when one successful firing out of five was common in the industry, and one out of three acceptable, the X-17 performed successfully in 92% of cases.

Scout's Initial Stages

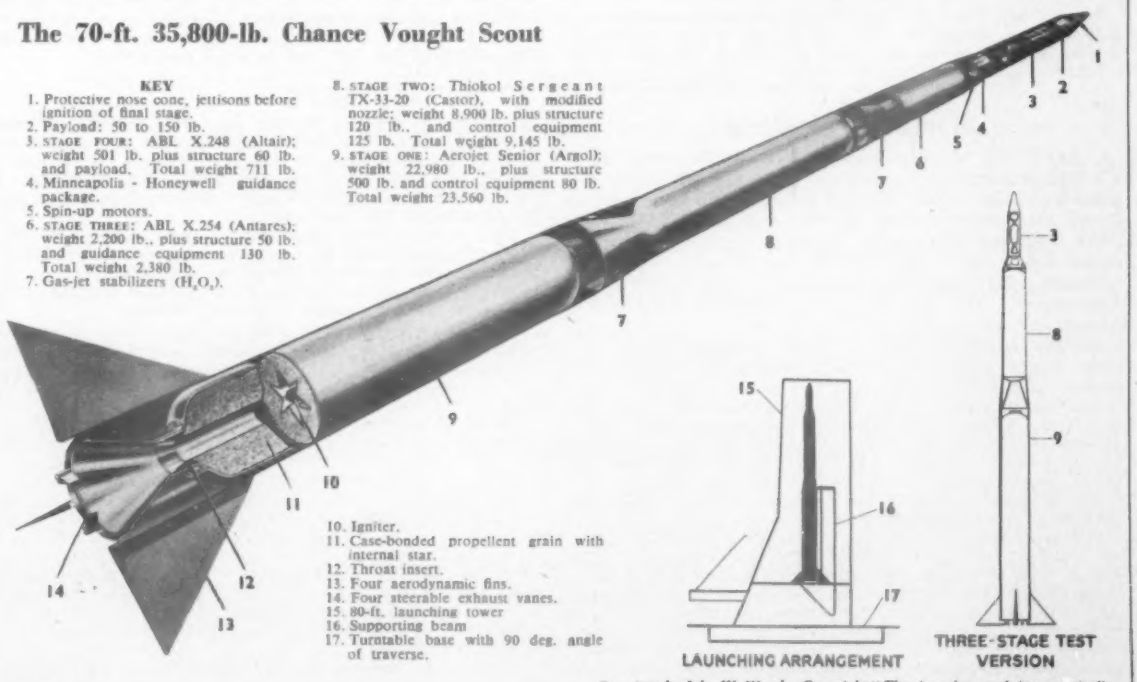
It is, in fact, the first stage of X-17, the Thiokol Sergeant TX-33-20, that serves as the basis of Scout's second stage, though it is fitted with a new nozzle. In its original form, this vehicle had a thrust of about 50,000 lb.

The first stage of the Scout vehicle is an Aerojet Senior engine which has played a prominent part in developing the

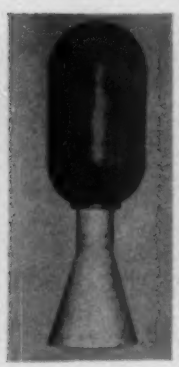
The 70-ft. 35,800-lb. Chance Vought Scout

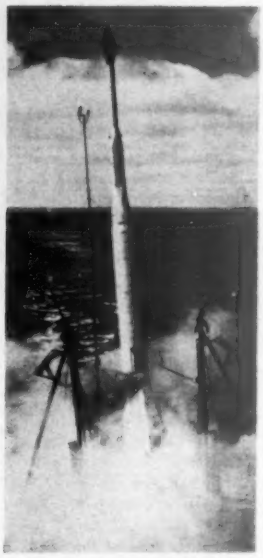
KEY

1. Protective nose cone, jettisons before ignition of final stage.
2. Payload: 50 to 150 lb.
3. STAGE FOUR: ABL X.248 (Altair); weight 501 lb. plus structure 60 lb. and payload. Total weight 711 lb.
4. Minneapolis - Honeywell guidance package.
5. Spin-up motors.
6. STAGE THREE: ABL X.254 (Antares); weight 2,200 lb., plus structure 50 lb. and guidance equipment 130 lb. Total weight 2,380 lb.
7. Gas-jet stabilizers (H_2O_2).
8. STAGE TWO: Thiokol Sergeant TX-33-20 (Castor), with modified nozzle; weight 8,900 lb. plus structure 120 lb., and control equipment 125 lb. Total weight 9,145 lb.
9. STAGE ONE: Aerojet Senior (Argol); weight 22,980 lb., plus structure 500 lb. and control equipment 80 lb. Total weight 23,560 lb.
10. Igniter.
11. Case-bonded propellent grain with internal star.
12. Throat insert.
13. Four aerodynamic fins.
14. Four steerable exhaust vanes.
15. 80-ft. launching tower
16. Supporting beam
17. Turntable base with 90 deg. angle of traverse.



Drawings by John W. Wood. Copyright "The Aeroplane and Astronautics"





SMALLEST AND LARGEST.—Extreme left, Scout's fourth stage was originally developed as Vanguard's third stage. Aerojet Senior (above) will provide initial thrust. Right, the Lockheed X-17 has contributed valuable experience for the development of the Scout.

propulsion end of Polaris. This stage is reported to have a total weight of 23,560 lb. The second stage, the improved Sergeant, weighs 9,145 lb., and the third stage—the only new motor of the four—is a scaled-up version of the Vanguard third-stage weighing 2,380 lb. This is being produced by the Allegany Ballistics Laboratory and is designated X-254. Stage four, the ABL X-248, is, in fact, basically the same motor as used for the final stage of Vanguard, Thor-Able and the U.S.A.F. Pioneer moon-probes.

Guidance and Launching

Guidance equipment, located just forward of the third stage engine, has the responsibility for controlling the three lower stages acting through a mixed system of exhaust vanes and gas-jets. The Aerojet Senior first stage is controlled by small steerable vanes, reminiscent of the V-2 system, which impinge on the exhaust gases; four triangular aerodynamic fins are also fitted.

Stages two and three each have a system of gas-jet controls employing the catalysed products of hydrogen peroxide. The final stage is spin-stabilized after the manner of the Vanguard third stage.

Launching will be made from an 80-ft. lattice tower which can be traversed through 90 deg. to suit various launching paths. The first three stages, firing consecutively, will be under the control of an elementary pitch programmer, but after firing and separation from stage two, the two upper stages will remain together and coast to the zenith of the trajectory. During this critical phase of the ascent, the attitude of the vehicle with respect to the horizon will be controlled by the guidance system in stage three, acting through the gas jet controls.

In this way, the final stage will be aligned accurately on a path which is tangential to the Earth's surface at the desired orbital height. When this point is reached, the final stage will be spun-up by small solid propellent rockets at about 160 r.p.m. and fired to achieve final orbital velocity.

Three-stage Test Version

The fact that the Scout draws so heavily upon existing rockets means that its development time should be comparatively short in comparison with a vehicle that has had to be designed from the beginning. Indeed, there is every prospect of an initial test version of this vehicle, omitting the third stage, being test-fired at the Pilotless Aircraft Research Station, Wallops Island, Va., this autumn.

At an estimated cost of $500,000, Scout is a fairly cheap rocket, in comparison with the Thor booster, for example, which an official U.S. publication prices at about $1,000,000. However, estimates have shown that if the Scout had been designed from scratch as an entirely new vehicle, taking full advantage of the latest solid propellents and employing optimum staging, it would have been half the weight and approximately half the cost in serial production.

Storable Propellents

A LECTURE which was bound to make the advocates of high-performance "solids" sit up and take notice was given before the Astronautics and Guided Flight Section of the Royal Aeronautical Society on June 4 by Mr. T. F. Dixon, Chief Engineer, Rocketdyne Division of North American Aviation.

Taking as his theme, "Storable Propellents for Future Rocket Applications," Mr. Dixon began by defining storable propellents as "those fuels and oxidizers which can be continuously stored in a missile in a state of instant readiness for relatively long periods of time without evaporating or corroding the containing structure."

The fact that none of the principal oxidizers in current use (e.g., liquid oxygen, nitric acid, and hydrogen peroxide) satisfy all the requirements of a storable oxidizer had intensified the search for better oxidants. The current liquid rocket fuels such as the hydrocarbons, hydrazine, amines, and alcohols, were generally stable and easily handled under ambient conditions; ammonia and hydrogen were exceptions.

However, hydrogen—because of its low molecular weight—was the fuel offering the highest performance per unit weight for chemical rocket engines. It was also a suitable coolant for the thrust chamber. Special liquefaction, storage, transportation, and line-transfer equipment were required because of its extremely low boiling point (−420 deg. F.).

Storability, therefore, must be a compromise between propellent performance and physical properties, a compromise which depends on the missile's particular mission.

Mr. Dixon emphasized, however, that there were a number of propellents which held their own with conventional combinations. Hydrazine/Hydyne and nitrogen tetroxide/unsymmetrical dimethylhydrazine had performances comparable to that of the conventional liquid oxygen/RP-1 combination. In substituting these into a LOX/RP-1 system, only minor component changes were necessary.

Two of the highest performance combinations, because of their specific impulse and density, were chlorine trifluoride/hydrazine and chlorine trifluoride/monomethylhydrazine; they could also be used in an engine developed for LOX/RP-1 merely by making changes in certain materials.

The specific impulse of storable rocket propellents in operation or development today, Mr. Dixon said, ranged from about 263 to 294 sec. at sea level. It was reasonable to expect that four to six years, further development would see this increased to around 380 sec.

At the same time, rocket engines were being simplified and he thought it not unreasonable to expect that power units would eventually be produced which comprised merely a combustion chamber, a pump, and burster diaphragms replacing valves.

Not only were storable propellents important for keeping IRBMs and ICBMs in an instant state of operational readiness but they had growing importance for the future of astronautics. Any vehicle which had to remain in space for any length of time and then re-start its engines to alter course, or otherwise manoeuvre, would require efficient storable propellent systems. The fact that many such propellepts were hypergolic (self-igniting) made them especially attractive for this purpose, the lecturer concluded.

Incidentally, non-storable propellents now go under the name of "cryogenic"—a new word for the rocketeer's glossary.

—K.W.G.

WHY

RIDDLE airlines

CHOSE THE ARGOSY

More air freight is carried in the United States than in the rest of the world combined — so it is no wonder that the U.S. operators are more cost-conscious. That is one of the reasons why Riddle Airlines Inc. have placed a provisional order for the Armstrong Whitworth 650 Argosy. This major break-through in the dollar market is a tribute to the economics of this new British aircraft — the world's first pressurised turboprop freightercoach.

Mr. George L. Giles, President of Riddle Airlines, comments: "Apart from its lower direct operating cost, the Argosy will benefit the indirect expenses, due to lower handling costs . . . The AW.650 is the first aircraft to be designed and produced with this in view. With minimum reorganisation, the Argosy's quick loading and turn-round will save us at least 20 per cent on handling alone ".

The Armstrong Whitworth Argosy offers cheaper freight rates because:

1. It is 30 per cent cheaper to operate than Riddle's existing twin-engined freighters.
2. The refined loading systems available with the aircraft, together with a full-width freight door at both ends of the fuselage, give rapid turn-round and help to reduce indirect costs to a minimum.
3. The Argosy is extremely simple to service — accessibility has been built in to the design — and it can operate from semi-prepared strips.
4. An extensive service organisation for many of the components — chosen for proven reliability — already exists in most parts of the world.
5. Coast-to-coast operation in the United States is possible within 24 hours, with only one traffic stop or as many as four.

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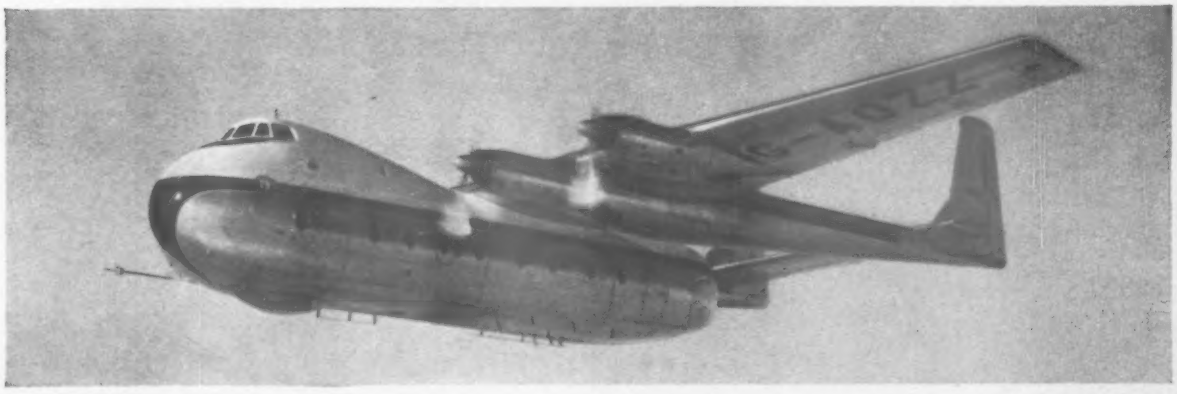
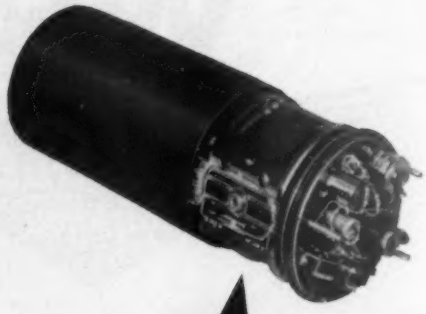


PRECISE NAVIGATION AND CONTROL



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Thunderbird Developments

SINCE the Army showed to the Press its team of instructors learning to use its new Thunderbird surface-to-air missiles at the Royal Artillery's A.A. School at Manorbier, as recorded in our issue of June 5, reports have appeared about the Mark 2 version of this SAM, now under development by English Electric Aviation, Ltd. This new version is said to have a constant-wave radar guidance system, and to be far advanced in development.

Meantime, the first Thunderbird regiment is expected to be operational with the Mk. 1 version in twelve months' time. A mobile missile system, the Thunderbird is intended to protect the Army in the field from aerial reconnaissance and attack. Low-level cover has still to be provided by the latest versions of the Bofors guns used in the last war.

In the field first warning of an enemy attack is passed by the early warning system to the battery command post. This alerts the unit's tactical control radar which searches for the target. Having found the target the T.C. unit passes the range and bearing to a target illuminating radar by way of the command post. The T.I. radar directs a pencil beam of radar pulses towards the target and locks on to this as soon as it is found.

Missile launching is controlled by the launch control post. Under orders from it the missiles are prepared for launching. By the time radar echoes from the target are picked up by their guidance detectors, Thunderbirds have been prepared for firing. As soon as the return signal from the target is strong enough, and the missile's detector has locked on to it and been tuned to give the best reception, the missile can be launched.

The four solid-fuel boosters are fired, accelerating it to supersonic speed. The solid-fuel sustainer takes over propulsion just before the boost motors burn out and fall away from the missile.

The actual firing is made by the launch control post under orders from the battery command post, which is the nerve centre of a Thunderbird unit.

According to the commandant at Manorbier, the Mk. 1 missile is susceptible to radar-counter-measures, but a later version will be virtually immune to these and will also have other advantages. It has been reported, as we have said, that the Mk. 2 missile has constant-wave guidance. It is interesting to speculate on the advantages of this system and also on other ways in which the Mk. 1 missile could be improved. This guidance technique may also be used for the Mk. 2 Bloodhound SAM.

As well as giving more immunity to counter-measures, C.W. guidance might well improve the effective range of a missile. The signal-to-noise ratio is an important factor in missile operations; this is likely to be better with C.W. than with pulse-radar techniques, allowing a missile to be launched when the target is farther away.

If a greater radar range could be achieved, it would be logical to increase the propulsion range of the missile. This could be done without increasing its size if larger boosts with a higher specific impulse were used; a sustainer motor with a higher S.I. would also be beneficial.

With the greater range and accuracy inherent in C.W. guidance it would probably be possible to intercept smaller targets, such as stand-off bombs, at greater altitudes and ranges. To gain full benefit from this guidance technique it would be advantageous to launch the missile before it was locked onto the target; with the Mk. 1 Thunderbird the launch must be delayed until the missile's guidance system is locked on.

Another and very important advantage of C.W. guidance is that it allows a missile to intercept a low-flying target; this is virtually impossible with pulse-radar guidance because the target cannot be distinguished from ground clutter.

Clearly, the use of constant-wave radar has big advantages; if it is indeed used on the Mk. 2 Thunderbird, this missile promises to be very effective and a considerable advance on its first-generation counterpart now entering service.—J.R.C.

THUNDERBIRD IN ACTION—This model at Manorbier shows how a Thunderbird unit is deployed in the field. Key: (1) Battery command post; (2) T.C. radar; (3) T.I. radar; (4) Launch control post; (5) Missile on launcher (the puff of smoke hides a launcher from which a missile has been fired); and (6) assembly and arming area.

Astronautics and Missile News

SATELLITE MATERIALS. — A $525,000 contract for a two-year research programme to determine the characteristics of four newly developed titanium alloys for missile and satellite application has been awarded to Lockheed's Georgia Division at Marietta. The programme will develop the design and mechanical properties of the new metals and will also determine the fatigue limit for these materials up to 900° F.

WOOMERA EXTENSION.—Work on lengthening the Woomera rocket range in preparation for the launching of the Blue Streak LRBM was ahead of schedule, said Mr. Townley, Australia's Minister of Defence, on June 5. The impact area at Talgarno, West Australia, was being linked with the range head at Woomera by means of a 1,250-mile telephone line, with intermediary connections at the new radar tracking stations at Redlake and McDouall Peak, in South Australia, and Giles weather station in the West.

LUNIK LAUNCHER.—An assessment of U.S. and Russian satellites and space-probes by the National Aeronautics and Space Administration comments "unofficially" on the characteristics of the Lunik launching vehicle, described as the T-3, having three stages and a "speculated total thrust" of 580,000 lb.

GODDARD SPACE CENTER.—The NASA's new Space Projects facility now being built at Greenbelt, Maryland, will be named the Goddard Space Flight Center, after the American rocket pioneer. The Center will be responsible for the development of satellites, space-probes and vehicles, tracking, communications, and data reduction systems; eventually, it will also become a command control centre for the NASA space-flight operations.

DISCOVERER III.—An attempt to orbit four black mice in Discoverer III launched on June 3 from Vandenberg Base in California failed when the satellite stage apparently re-entered the atmosphere a few minutes after firing. A capsule containing the mice, which were instrumented to record their pulse, heart action and muscular activity, was supposed to eject from the Discoverer on its 17th orbit, be slowed down by a retro-rocket and descend by parachute.

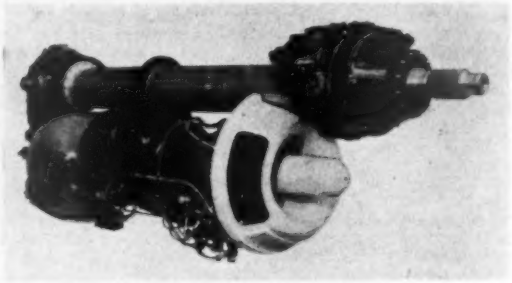
General Aviation News

SEA VIXEN ORDER.—The Royal Navy has ordered a further substantial number of de Havilland Sea Vixens and the company expects that as a result work on the aircraft will continue at least up to late 1961. The Sea Vixen is in full production at D.H.'s Christchurch factory.

SIMPLE RAMJET.—A small ramjet which burns pyrophoric fuel has been developed by the Allison Division of General Motors to power air-launched target drones. Known as the PD-37 Pyrodyne, it will give a thrust of 60 lb. at Mach 2 at 70,000 ft. and is likely to cost under $1,500 per engine. Pyrophoric fuels ignite spontaneously on exposure to air.

ANOTHER TURBOFAN. — General Electric have designed a smaller turbofan engine based, like the CJ-805-21/23, on the J79. Designated the CJ-810, it has a single-stage fan driven by the final turbine stage and will be in the 7,000-9,000 lb.s.t. class.

T64 DETAILS.—Information has been released on the T64 engine being developed by General Electric for the U.S. Navy. Available both as a turboprop and turboshaft engine, it weighs 1,079 lb. as a turboprop and delivers 2,570 e.s.h.p. with an s.f.c. of 0.522 lb./e.s.h.p./hr. The turboshaft engine weighs 854 lb. and delivers 2,570 h.p. at an s.f.c. of 0.506 lb./s.h.p./hr. The engine has a 14-stage axial-flow compressor, a two-stage gas-generator turbine and a two-stage free turbine.



NEW GNOME.—The turboprop version of the de Havilland Gnome is designated H.1000; the initial version will deliver 1,000 s.h.p.

NAVIGATION TRAINER.—Lockheed Aircraft Service has introduced a new navigation training device designed to instruct flight personnel in the theory and operation of VOR/DME systems. Identified as LAS Model 105, the VOR/DME visual training aid utilizes a movable aircraft silhouette positioned on a co-ordinate-type, flight-exercise display panel, a simulated beacon station, and over-sized instrument mock-ups.

S.A. ULTRA-LIGHT. — What is claimed as the first ultra-light home-built aircraft in South Africa recently passed its airworthiness tests at Wonderboom, near Pretoria. It is a Turbulent, registered ZS-UAA, built by Mr. Howard Endean.

U.S./FRENCH AGREEMENT. — Pratt & Whitney aero-engines are to be manufactured under licence in France by SNECMA. The agreement provides for Pratt & Whitney to receive a 10% share in the SNECMA capital; the French company will build the whole range of P.W. engines now in "regular production" concentrating on the J75 and civil JT4.

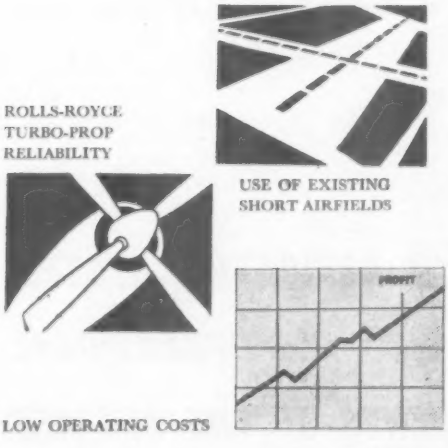
(*Continued on page 703*)

Air Marshal SIR HAROLD LYDFORD, Chairman of The National Council
"ARE THE AIR-SEA RESCUE PEOPLE STANDING BY...?"
"GERRY" BOAK General Secretary, R.A.F.A.
"THE MEMBER ASKS 'WHERE WILL NEXT YEAR'S CONFERENCE BE HELD?' - THE ANSWER IS IN THE ALTERNATIVE."
Sqn. Ldr. "JOHNNY" JOHNSON, Dep. Gen. Sec. R.A.F.A.
Air Marshal SIR ROBERT SAUNDBY Life Vice-President
Air Marshal SIR GEOFFREY TUTTLE, Deputy Chief of the Air Staff
Air Chief Marshal SIR RONALD NELAN-CHAPMAN Vice-President, R.A.F.A.
MAURICE LIDDELL Chairman, Pensions & Welfare Committee
THE LORD TEDDER President
Marshal of the R.A.F. LORD TEDDER President, R.A.F.A.

An account of the R.A.F.A. conference appears on page 698.

The Truly Economic Short-Haul Aircraft

AVRO 748 FLIES EARLY NEXT YEAR



Here is an aircraft which offers genuine economy to operators on short-to-medium range routes.

The Avro 748 combines a simple "fail-safe" structure, low wing for added safety and pressurised accommodation for passengers and crew with existing well proven components. It is ideally suited for operation from short airfields and can also operate from semi-prepared surfaces if required.

At low initial cost this aircraft offers maximum economy and servicing simplicity with all the advantages of Rolls-Royce propeller turbine power plant. The Avro 748 will fly early next year and will be in service in 1961. It represents yet another major step by Hawker Siddeley Aviation towards bringing the cost of air transportation down to a minimum level.

HAWKER SIDDELEY AVIATION LTD., Richmond Road, Kingston-upon-Thames.

INTERNATIONAL SALES OFFICE, DUKE'S COURT, ST. JAMES'S, LONDON, S.W.1.

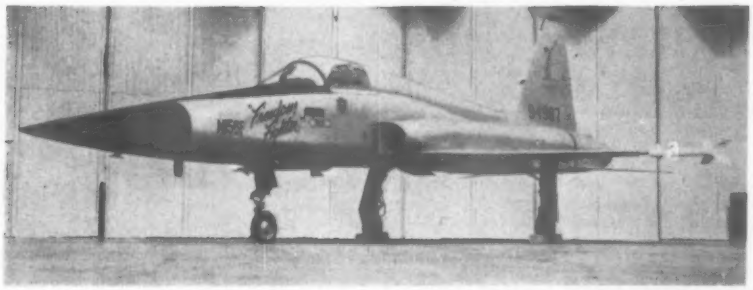
"The need for a high accuracy hyperbolic navigation system giving cover from ground level up to the highest altitudes used by commercial air transport is already being felt in some parts of the world, and it is the United Kingdom belief that the problems will become even more urgent when jet aircraft begin to operate in appreciable numbers. The United Kingdom is fully satisfied that the Decca Navigator System is potentially able to meet this need and the needs which will develop from the introduction of even higher performance aircraft, and believes the assertions it has made regarding the outstanding operational advantages conferred by the Decca System are unassailable."

Extract from the Final Statement by the United Kingdom Delegation at the Special Com/Ops/Rac ICAO meeting Montreal February 1959

THE DECCA NAVIGATOR

THE ONLY NAVIGATION SYSTEM CAPABLE OF MEETING THE OPERATIONAL REQUIREMENTS OF THE JET AGE

THE DECCA NAVIGATOR COMPANY LTD LONDON



NATO-SEATO FIGHTER.—As a clean fighter with a Sidewinder at each wing tip, but without external fuel tanks, the Northrop N-156F weighs about 12,200 lb. and achieves Mach = 1.5 at 38,000 ft. Powerplant is two General Electric J85-GE5s with afterburning. Flight test is scheduled for July.

(*Continued from page 702*)

X-15 PROGRESS.—First free flight of the X-15 research aircraft was on June 8 when it was dropped from its B-52 carrier aircraft at 38,000 ft. It took six minutes to glide down to a landing on Muroc dry lake near Edwards Air Force Base in California. Mr. Scott Crossfield flew it.

GOLFING WINS.—The Aero Golfing Society held their first Summer Meeting at Swinley Forest G.C. on June 2. Winners of the morning competition for THE AEROPLANE Goblets were F. A. Laker and J. G. Drummond; runners-up K. D. Morgan and R. R. S. Cook. The afternoon competition for the Captain's Prize was won by R. E. Hardingham and P. Q. Reiss; runners-up F. A. Laker and J. G. Drummond.

OPPORTUNITY.—There is a vacancy for an Advertisement Representative on THE AEROPLANE AND ASTRONAUTICS staff. Applicants, who should preferably be between the ages of 30 and 35, should write, stating full personal details and experience, to the Advertisement Manager, THE AEROPLANE AND ASTRONAUTICS, Bowling Green Lane, London, E.C.1.

LANDING TROPHIES.—On May 23, landing competitions were held at the Lancashire Aero Club's aerodrome at Barton. The Rodman Trophy for pilots having more than 50 hr. was won by N. Taylor; the Pemberton Trophy for pilots with less than 50 hr., by D. H. Geard; and the Hart Trophy for visitors by D. Westoby.

HELIPORT REJECTED.—The Minister of Housing and Local Government has rejected a proposal by Rotorports, Ltd., to build a permanent Thames-side heliport at Brunswick Wharf, Nine Elms Lane, Battersea. Noise was cited as the principal objection.

SAFETY APPOINTMENT.—The Flight Safety Foundation of America has elected Sir Victor Tait, chairman of International Aeradio and of the Air Transport Electronics Board, as a board member. He is the first non-U.S. citizen to be elected to the governing body of the Foundation.

GERMAN ORDER.—An order valued at $8,700,000 for 25 Sikorsky S-58s and spares, has been placed by the German Ministry of Defence, which purchased 26 helicopters of this type two years ago.

CHANGED DATE.—No. 66 (F) Squadron Reunion has had to be changed from July 24 to September 11 because of Service commitments.

Commercial Aviation Affairs

ELECTRA FIX.—To overcome a persistent vibration and noise problem in the Lockheed Electra, the thrust line of the engines is being raised from 1° down to 2° up. According to Mr. F. Judd, vice-president operations of Northwest Airlines, Lockheed has spent $16m. on study and elimination of this snag. Northwest will put the Electra into operation next month.

CALAIS OCCASION.—On June 11, the new "Aerogare Bleriot" airport terminal at Calais-March Airport was to be opened officially by Madame Bleriot in a ceremony to commemorate the 50th anniversary of Louis Bleriot's first cross-channel flight. Calais is of growing importance as a cross-channel terminal for vehicle ferry and "no passport" day trips. A new 4,430-ft. runway has been laid and the terminal includes under-cover reception for motorists and a new restaurant, bar and lounge.

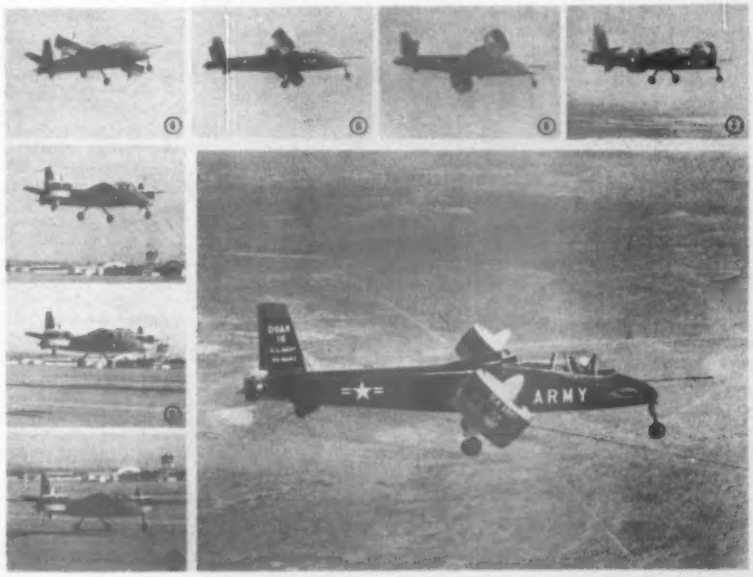
SUDAN INAUGURAL.—On June 8 the first of Sudan Airways' London-Khartoum Viscount services left Gatwick Airport for the Sudan, flying via Rome, Athens and Cairo. The Viscount is crewed and maintained by Airwork. Sudan Airways, incidentally, is the first foreign scheduled airline to use Gatwick.

T.W.A. CHANGES.—A new senior vice-presidency that of system general manager, has been made in the organization of Trans World Airlines. It is held by Mr. E. O. Cocke (formerly sen. v.-p., sales), and he will be directly responsible to the president, Mr. Charles S. Thomas, for all operations and day-to-day business. Mr. Cocke will be assisted by a v.-p. and general transportation manager, Mr. Floyd D. Hall (formerly v.-p. flight operations); and a v.-p. and general sales manager, Louis P. Marechal (formerly v.-p. sales, Atlantic region).

MORE 720s ORDERED.—United Air Lines has increased its order for Boeing 720s from 11 to 18. Total cost of the extra seven aircraft will be $35 million, including spare engines and parts. No additional financing will be required, according to United's president, Mr. W. A. Patterson, who took delivery, on June 3, of the airline's first jet aircraft (a DC-8) in a $310 million re-equipment programme. Changes in the Boeing 720 design since United's first order, on November 22, 1957, have increased its "point-to-point" speed to a maximum of 615 m.p.h. Deliveries will begin in mid-1960.

FIRST FOR UNITED.—On June 3 Douglas formally delivered the first of 40 DC-8s to United Air Lines for crew training and familiarization. This aircraft, which has a provisional C. of A., is the eighth from the line. DC-8 numbers 1, 3, 4, 7 and 8 are domestic models with JT-3C-6 (J57) while numbers 2, 5 and 6 are powered by JT-4A (J75) engines.

DOAK TRANSITION.—Full transition from a vertical take-off to horizontal flight by the Doak convertiplane has now been made.



Flying the Piper Comanche

By John Fricker

BUSINESS flying in the United States is big business, and the range of ultra-modern light aeroplanes available for executive use has grown rapidly in recent years. One of the latest additions is the sleek Piper PA-24 Comanche, which first flew on May 24, 1956, with the initial production aircraft following on October 21, 1957.

No fewer than 800 Comanches were subsequently sold in the first year of production, which has since continued at a similar rate. Two versions of the aircraft are being produced; for maximum economy, and 160-m.p.h. cruising speed, the four-cylinder 180-b.h.p. Lycoming O-360-A1A is available, while for a 180-m.p.h. cruise and the highest performance, a similar engine with an additional two-cylinders—the 250-b.h.p. O-540-A1A—is specified.

Most of the Comanches so far produced have remained in North America, but a dozen or so have reached Europe to date, having proved particularly popular in Germany, where there is no aircraft import duty. This means that only delivery charges of £750-£900 need significantly be added to the basic factory costs of £5,356 or £6,784, respectively, for the 180- or 250-b.h.p. machines in standard form. In the U.K., of course, import duty is 17½%; with the C. of A. and registration fees the cheapest Comanche costs about £7,450, and the highest-powered type just over £9,000; but these are still very low prices for such high-performance aircraft.

A 1959 example of the 250-b.h.p. Comanche, still wearing its American registration, was brought to the recent Kidlington sales week-end by M. Robert E. Goemans, Piper's Continental distributor, who kindly made it available for two familiarization flights. The first trip was in the most appalling weather imaginable, in which my sole concern was getting back on the ground, but the second took place in very much better conditions, and enabled an excellent impression to be gained.

Like most American light aircraft the Comanche brilliantly combines styling and engineering in its all-metal structure, which borrows several features from supersonic military machines. The wing is of NACA. 64_2 A215 laminar-flow section, with a single deep main spar at its maximum thickness nearly half-way along the chord, while the tailplane, of similar construction, is of the all-moving or "slab" type, with an anti-servo and trim tab. This type of tailplane, or "Stabilator" as it is called by Piper, is unusual in a light aeroplane, but it conforms with the overall low-drag conception of the Comanche by providing effective control and stability for 25% less area.

There are no apparent external differences between the 180-b.h.p. (N5165P) and 250-b.h.p. (N5100P) Comanches, as this photograph shows.

Positive directional stability is conferred by the swept fin, which, however, is primarily styled to match the sleek fuselage, giving the aircraft an eager appearance, as it squats low on its short tricycle undercarriage. All three wheels are equal in size, with low-pressure tyres, for operation from rough grass or other unprepared surfaces. The mainwheels have disc brakes; the nosewheel is steerable through 40° from the rudder pedals; and the legs are electrically actuated, with retraction or extension times of 7 sec.

The low wing provides easy access to the cockpit, which is entered in the standard American fashion via a large forward-hinged car-type door on the starboard side. The only disadvantage of this arrangement is that aerodynamic forces tend to pull the door ajar in flight, which could be embarrassing, but a safety lock guards against this eventuality. The cockpit is tastefully furnished in the usual U.S. automotive style, with individual adjustable front seats, and a 44½-in. wide rear bench seat for the other two occupants.

The mainspar runs unobtrusively beneath the rear seat, the back of which is adjustable to four positions. Armrests and individual ventilators are provided beside each seat, and behind the rear bench is a baggage compartment with a capacity of 200 lb., or 20 cu. ft., and an external access door. Automobile practice is extended to the provision of sun vizors over the steeply raked front screens, although there is rather less window area than in most American cars.

The only noticeable limitations of view, however, are to the rear and directly above, although in my first trip, in heavy rain, I found that the front screen became rather obscured. The large downward-folding clear-vision panel in the port side-window therefore proved invaluable, although on opening it the increase in noise level makes one realize just how good is the soundproofing.

Instrument layout is neat and functional, with a full flight panel on the port side and engine instruments to starboard of the deep front dash between the dual push-pull handwheels. On the extreme port panel are the radio controls, for equipment which includes a Narco Mk. V transceiver, with a 190-channel receiver, and ADF. Along the bottom of the panel are electrical switches, a key-type ignition switch, starter button, and parking-brake handle.

As the nosewheel steers, braking is not differential, being applied when required by a long lever extending below the front panel. Bottom centre of the panel is occupied by the plunger controls for mixture, throttle and pitch, the last-mentioned with the usual American rotating vernier adjustment for the Hartzell constant-speed airscrew. Continuing along the panel one comes to carburetter heat, "AutoFlite" control, cigarette lighter, heating and ventilation knobs, getting progressively out of reach from the left-hand seat.

From this position I started the Lycoming under the direction of M. Goemans, after selecting the fuller of the two 25-gal. wing-root fuel tanks, with their individual gauges in one of two strips on the centre panel. Glancing at the tachometer, on the far right of the panel, I noticed that the engine-hour recorder incorporated in the dial indicated only 38 hr. total time, so that N5714P had done little flying since its trans-atlantic delivery flight by Max Conrad.

Rudder loads for nosewheel steering when taxi-ing are light, and ground manœuvrability is excellent. The pre flight checks, however, revealed one of the few features of the Comanche to cause a frown. This was the trimmer arrangement, in which longitudinal bias is applied by a cranked handle in the roof, and directional trim via a large knob stuck on the side of the nosewheel stowage fairing.

The fact that the latter control is seldom needed diminishes the importance of its separation from the elevator trim, which comes in for rather more use. The low-geared but sensitive elevator crank originated in the classic Cub, where on the port wall of the cockpit it worked in the logical sense and

Photographs copyright "The Aeroplane and Astronautics"

N5714P, the 250-b.h.p. Comanche flown at Kidlington by the author was brought across from the Continent by M. Robert Goemans.

plane, but in the current range of Piper aeroplanes it has been moved to the roof position, where it does neither.

It obviously causes no difficulty in the States, where it was common to more than 2,000 Piper aeroplanes sold last year, but it comes slightly strange to the European pilot, used to a central trim wheel, or a similar logical system. The Piper crank also differs diametrically from a similar control, in, for example, the Auster, in rotating clockwise for nose-up trim and vice versa.

Flap extension is by a direct manual linkage from an easily managed central lever, with intermediate positions at 9, 18 and 27°. The flaps are of the plain type, and are not strikingly effective. They were not used on my first take-off, into a very strong wind, when the predominant impression was of the tremendous acceleration on opening up to 2,575 r.p.m.

With neutral trims there was little or no tendency to swing, and with slight aft pressure on the wheel, the Comanche unstuck at about 70 m.p.h. after a run of less than 300 yd. on the grass airfield. A flip of the simple lever on the instrument panel brought the undercarriage up with no perceptible change of trim, and the cruise-type climb was continued at an invigorating 110 m.p.h. The best rate of climb, of nearly 2,000 ft./min. on the V.S.I. with two occupants on board, is achieved at 96 m.p.h. I.A.S. Full power can be maintained indefinitely if required, although normally a slight reduction after take-off saves wear and tear on the engine.

A useful feature of the A.S.I. is that its inner scale is calibrated in knots, while the outer scale is "green-lined" in the characteristic American manner between the limiting speed extremes of 65-225 m.p.h. Soon after my first take-off the heavy rain encountered made it apparent that the high-speed capabilities of the Comanche could not be explored, so regretfully I throttled back to below the undercarriage limit of 150 m.p.h., applied some compensatory nose-up trim, and lowered the gear for bad-weather circuit.

Opening the clear-vision panel improved matters, and speed was reduced comfortably to about 100 m.p.h. without flap. I could do little more than to feel the Comanche cautiously back to the ground, but it says much for its docility that this could be done on one's first flight with very little difficulty.

A later flight in less exacting conditions confirmed the tractability at all speeds, as well as the spirited performance of the Comanche. Its handling is of the "no-nonsense" type, with pleasantly harmonized controls, pronounced stability and generally moderate stick forces. The ailerons are light and effective throughout the speed range, and the slightly heavier longitudinal control via the slab tailplane is probably a good thing to avoid the likelihood of overstressing the Comanche at the high speeds made possible by its very clean airframe.

With the 250-b.h.p. engine there are noticeable but not pronounced changes of longitudinal trim with power, and the out-of-trim forces remain throughout at only a few pounds. They also tend to cancel each other out when reducing speed for undercarriage and flap extension, which further reduces the Comanche's demands on its pilots. These are reduced to little more than take-off and landing by the installation of the Piper "AutoFlite" single-axis autopilot, which will maintain a selected heading and level-flight attitude after longitudinal trimming, for hands-off flight.

The operation of this simple transistorized system, which actuates the ailerons through a slightly modified directional gyro and artificial horizon, was described in detail in our issue of May 22, and with its help we cruised along in N5714P in rough air with remarkable precision. At 22.6-in. Hg. and 2,400 r.p.m. (75% power) at 3,000 ft., we were indicating 165 m.p.h. or so, which becomes a remarkable 181 m.p.h. T.A.S. at the optimum 7,000 ft. for a fuel consumption of only 11½ g.p.h. At this high cruising speed, the effective range is 780 miles, but this can be increased to a 1,100 miles by cruising at 147 m.p.h. using only 6.7 g.p.h.

With its impressive power margin and responsive controls, the Comanche is exhilarating to fly, but it is surprisingly docile in low-speed handling, with unusually good aerodynamic stall warning. On reduced power it naturally loses speed fairly slowly, and essaying a clean stall took a little time. Increasingly strong effort was required to pull the nose above the horizon, until at about 80-85 m.p.h., a high-frequency judder manifested itself, growing in magnitude until the gentle stall breakaway took place at about 75 m.p.h. I.A.S.

This aerodynamic reminder was far more intrusive than the stall-warning light which, with flap and undercarriage extended, began blinking at about 80 m.p.h. slightly before the onset of airframe buffet. This vibration was maintained until the nose dropped at about 70 m.p.h. I.A.S. (64 m.p.h. T.A.S.), but lateral control remained up to that point and the stall itself was quite straight. The small differences between the various stalls did, however, point to the possibility of the Comanche being slightly under-flapped.

The cockpit of the Piper Comanche follows fairly closely American automobile practice, and is well laid out. Flanking the nosewheel stowage "hump" are the brake and flap levers.

This was not particularly apparent when landing at Kidlington, but the Comanche is probably not intended to operate into small fields with poor approaches. In the circuit, flap can be lowered below 125 m.p.h., and with only slight nose-up trim required, the aircraft can be motored in comfortably on finals at about 85 m.p.h. Elevator control remains precise for the round-out and with the soft undercarriage facilities a very smooth touch-down.

In all, the Comanche proved an exciting but not exacting vehicle, providing a standard of flying of disproportionate luxury to its low price bracket. Even in its standard form, the Comanche incorporates full night-flying equipment, including twin landing lights near the wing tips, not to mention an electric cigarette lighter and individual ash trays.

In being designed for businessmen rather than pilots, the Comanche represents a concept hitherto unknown in this country, and this accounts for some of its divergences from traditional aeronautical approaches. The fresh thinking it successfully incorporates contains many lessons, however, for our own designers and engineers.

Leading Particulars

DIMENSIONS.—Span, 36 ft. 11 in.; length, 24 ft. 9 in.; height, 7 ft. 5 in.; gross wing area, 178 sq. ft.

WEIGHTS.—(180-b.h.p. version in parentheses), empty, 1,600 lb. (1,475 lb.); disposable load, 1,200 lb. (1,075 lb.); gross, 2,800 lb. (2,550 lb.).

PERFORMANCE.—(180-b.h.p. version in parentheses), max. speed, 190 m.p.h. (167 m.p.h.); cruising speed, 75% power, optimum altitude, 181 m.p.h. (160 m.p.h.); initial climb, 1,400 ft./min. (910 ft./min.); service ceiling, 20,000 ft. (18,500 ft.); stalling speed, with flap, 64 m.p.h. (58 m.p.h.); take-off run, 750 ft.; landing run, 650 ft. (600 ft.); normal range, 780 miles (960 miles) in 4.3 hr. (6 hr.).

Book Reviews

KNIGHT OF THE AIR: The Life of Antoine de Saint-Exupéry. By Maxwell A. Smith. 227 pp., 5¼ in. by 8¼ in. Cassell and Co., Ltd. Price 18s.

THIS biography of a very great writer will be of special interest to those who think of Antoine de Saint-Exupéry as an author rather than as a pilot of the days of pioneer flying—the great days of French airline development by Latécoère and Aéropostale in North Africa and South America. It deals with the development of Saint-Exupéry as a man and a writer rather than of his earlier life as a dedicated pilot on the undeveloped air routes.

Which is as it should be. Saint-Exupéry will be remembered as an artist rather than as an aviator, and his books will continue to be read because of his magnificent descriptive writing and his studies of human character under stress, rather than as personal records of transport flying in the pioneering days.

"Knight of the Air," with its understanding glimpses of "Saint-Ex" as a writer and a philosopher, and with its cautious and sometimes even inarticulate approach to the actual business of flying, somehow (if accidentally) manages to stress the greatness of Saint-Exupéry's work as a descriptive writer and to show something that is missing, at least in his translated books—the full interpretation of the art of flying as felt by a pilot.

Like thousands of others I have enjoyed Saint-Exupéry's books and have felt his experiences and the impact of his world with him. But one thing has always been lacking for me—and that was the feeling of being with him in the pilot's seat facing his more immediate problems and following with him the reactions of his aeroplane.

For readers who have never discovered Saint-Exupéry, this biography, with its successive series of long quotations, will provide an effective entry into his world.—H.A.T.

JETS AND ROCKETS. By A. Barker, T.R.F. Nonweiler and R. Smelt. 268 pages, 5¼ in. by 8¼ in. Illustrated. Chapman and Hall. Price 35s.

THIS is an interesting book, written with clarity, and attractively produced. Each of its three authors has at one time or another been closely concerned, in various capacities, with jet-propulsion technology.

The general content covers the theory of reaction propulsion, the basic design and performance features of aircraft gas turbine, rocket, ramjet and pulse-jet engines, and also includes highly relevant discussions of the aerodynamic and ballistic problems associated with those power units.

As a general survey of jet-propulsion theory, the book is useful and adequately comprehensive. As a survey of rocket and aircraft gas-turbine history and construction, the coverage is strictly limited. Those aspects of the text are good so far as they discuss German wartime rocket developments, now 15 to 20 years old—beyond this there is insufficient attempt to include descriptions of subsequent and modern designs.

For a book published early in 1959 one might reasonably expect to discover reference to the Armstrong Siddeley Screamer and de Havilland Spectre rockets, rather than just the Snarler and Super Sprite—and likewise reference to the Saunders-Roe S-R.53 and P.177 rather than the Hawker P.1072 as examples of rocket-plus-turbojet interceptors.—K.T.F.

Victory in the Netherlands

WHEN Philip Wills came out top in the Netherlands Gliding Championships, which were held during the fortnight following Whitsun, this was not the first time a national gliding contest had been won by a foreign visitor. It has already happened between France and Germany.

It took Philip Wills a couple of days to reach the head of the list. The first event, a 100-kilometre triangular race, was won by the only other foreign visitor, Hans-Werner Grosse from Germany, who earned 1,000 points with his 15-metre Ka-6BR, the type which won the OSTIV prize last year at the World Championships in Poland.

Fritz Seyffert, of the Delft Students' Aero Club, who eventually became the new Dutch champion, started promisingly in 3rd place—i.e., first among the Dutch pilots. The previous champion, Willem Toutenhoofd, who has flown for Holland in the last two World Championships, made a bad start with only 26 points for going a few miles.

The national gliding centre at Terlet, 5 miles north of Arnhem on the road to Apeldoorn, is in one of the few regions of Holland which rise well above sea level. It is 300 feet up and consists of sandy heath which can be relied on for producing plenty of thermals whenever thermals are to be expected at all. As for the canal-ridden lowlands, there is a close enough distribution of towns to provide thermals for crossing the damp regions between, according to Wills.

In the contest were 23 entries. Twelve of these were Skylark 2s, and Holland's presumed 12 best pilots were put on them so as to enable an accurate comparison of piloting skill to be made when choosing the team for next year's World Championships. Unfortunately this neat scheme was upset by a few pilots flying other types who persisted in doing better than the chosen.

In particular there was Sypko Andreæ, who had expected to be out of the country but found at the last moment that he could take part after all. So he was allowed to fly a Skylark 3 unofficially and received unofficial placings, starting as "4A" and finishing as "1A," second only to Philip Wills and beating Seyffert, the official champion. Two other non-seeded pilots did well, Arie Breunissen finishing 5th with a Sky and Jos Krols 6th with a Skylark 3—i.e., 3rd and 4th among the Dutch competitors. So who will be chosen for next year's international team?

To return to the contest: the second task was a race to Bree, the airfield for Maastricht, 72 miles due south, but nobody got there. Philip Wills went farthest and obtained the 1,000 points. Toutenhoofd made a spectacular recovery and came second with 829. This race was followed by distance along a line through Beek in difficult conditions, when Wills far outflew the rest with 71¼ miles.

A race to Rotterdam, 64 miles due west, on May 23 proved quite exciting. Wills won it in 1 hr. 12 min., but many of the 12 who got there took only a few minutes longer. Grosse had bad luck; he only went 12 miles from his first launch, but instead of being retrieved in time for a second try, he had to sit there most of the afternoon because his over-confident wife had taken the trailer on to Rotterdam.

Sunday, May 24, was long-distance day, with Philip Wills trying for the 6th (or was it the 8th?) time to add a third Diamond to his Gold "C" by covering 500 km. He might have done it if there had been any cumulus clouds to mark the lift, but there were only "dry" thermals, which made for tedious going.

Wills landed after going 289 miles (465 km.); Grosse made 249 miles and 8 Dutch pilots exceeded 300 km., the best being Seyffert and Reparon each with 227 miles (365 km.). During his flight Wills never got above 4,000 ft.

I arrived on the following Wednesday just after a riotous breakfast at which Wills's birthday had been celebrated. The sky was covered with low stratus cloud, so launches were postponed till after 14.00 hr., when the sun occasionally broke through. This stirred up enough thermals to carry seven of the 21 starters all the way on a 49-mile race S.S.E. to Venlo. It was won by Dick Reparon with a Skylark 2; Grosse came 2nd, and Wills 5th, earning 851 points.

There followed an out-and-return race with a turning-point 50 miles to the N.E. near Coevorden. There were big cumulus masses with rain from some of them, and large areas of downcurrent.

Only on his third launch did Wills make a satisfactory get-away, and he found the icing at 7,000 ft. so ruinous to his gliding angle that thereafter he kept below 6,000. He, Grosse and Krols rounded the turning-point.

Within sight of the finish, Grosse started his final glide-in alongside of Wills, having forgotten in the excitement that (a) with 3 metres less span he had a worse gliding angle, and (b) since he had started 15 minutes later, he could afford time to gain extra height before starting the glide. So Grosse sank to earth a few hundred yards from the finishing line, while Philip Wills crossed it in solitary triumph.

The final task was again distance through Beek. Andreæ went 224 miles to Verdun, Breunissen 121 miles before hitting a cow and breaking his Sky, Seyffert 103 miles, and Wills 101 miles to a point N.E. of Luxembourg.

Leading total scores at the close of the contest were: Wills, 7,706 (out of a possible 8,000); Andreæ, about 6,740 (unofficially); Seyffert, 5,754; Grosse, 5,181; Van Bree, 4,941; Breunissen, 4,888; Krols, 4,449; Toutenhoofd, 3,949.
—A. E. SLATER.

Correspondence

A Chance for the Services

IN this age of rapid mobility it seems disappointing that none of the Armed Services have seen fit to commit themselves to entering the *Daily Mail* Air Race.

Considering the amount of public money expended by these Services on projects of doubtful value, one can hardly plead economy in not supporting this laudable competition. If private enterprise, i.e. the aircraft industry, sees fit to enter, it is disappointing to note that the Royal Air Force has so far shown no overt interest.

Lee-on-Solent. J. A. MEATH THOMSON.

A Permanent Display Needed

IT is good to read in your issue of May 22 the news about the Mosquito Museum, at Salisbury Hall. Congratulations to all concerned! Now, I would like to suggest that perhaps you could create interest for a special effort to be made to establish a museum for old types of aircraft of which many exist in this country, but beyond the Shuttleworth collection are never seen.

The Air Ministry had to my knowledge a considerable number of both War I and II aircraft stored in one of the balloon sheds at Stanmore Park, including German War I aircraft and I believe a Japanese Zero. Perhaps they are still there locked away in crates and cases.

Some time ago, I think, it was suggested that one of the hangars at the College of Aeronautics, Cranfield, might be adapted to house a collection of ancient aircraft. One can also suggest that hangar space might be made available at R.A.F. non-operational airfields such as Biggin Hill and Kenley, these being in closer proximity to London.

London, W.1. W. A. RAMSAY.

Help Wanted

I HAVE acquired a Tiger Moth in a fairly sound condition but without wings. Now I would like to get some information from you, if possible, in connection with some modifications I am going to try. If you cannot supply the information please give me the address of some person or firm who could do so.

I want to either make myself or else purchase a set of rotor blades to mount exactly as in an Autogiro. If someone could give me an address whereby I can obtain a set of blades I would be eternally grateful, say some pranged Cierva Autogiro, for instance, or even ex some helicopter that I could rig up.

Such a craft is going to be ideal for this kind of country as I should imagine that one could fly fairly slowly which would be ideal for game spotting, etc.

Bancroft, N. Rhodesia. M. H. RALPH.

[We have often thought, and indeed put forward the idea editorially that a revived version of the Autogiro would be specially suitable for African conditions. Perhaps there are readers who can help Mr. Ralph.—ED.]

No penalty without trial

WITH regard to Mr. Stedman's letter published on May 29, I feel sure we are both on the side of justice for the pilot and I do appreciate the significance of Art. 31 of the present Air Navigation Order.

However, I still suggest that where a specific charge is made against an individual, for which the law quotes a maximum penalty, then no person has the power to impose a greater penalty—let alone without a trial. I believe that principle would be supported by any legal authority up to House of Lords.

Woodford Green, Essex. R. H. AYERS.

Canadian Contribution

I WOULD refer to the article in THE AEROPLANE AND ASTRONAUTICS for May 8, describing the G.91 as Fiat's Flexile Fighter. On page 544, there is a reference to the fact that "One of the pre-production G.91s was modified to take several navigational systems, such as Decca and Rho-Theta, and was designated the G.91N." Rho-Theta is used as a generic term, and does not make it clear that the equipment used in this aircraft was, in fact, a specially adapted set of the standard R-Theta equipment, developed and produced in quantity by this company for the R.C.A.F.

This equipment was loaned for evaluation as to the method of navigation, at very short notice, but since then, development has proceeded, and on the basis of the experience of this company over many years, we are now proposing a version of the R-Theta equipment, particularly suited for single-seat aircraft. The original R-Theta was designed for two-seat aircraft such as the CF100.

We believe you will be interested in a description of this latest equipment, as it is unusual for equipment of this kind to be designed and made in Canada. It is more usual for it to originate in the United States or the United Kingdom, and we feel this fact is worth a note.

Toronto 16. E. B. Moss,
Vice-president, Engineering,
Canadian Applied Research, Ltd.

[We are glad to have this reminder from Mr. Moss and hope to follow up our detailed description of the original Canadian R-Theta equipment (THE AEROPLANE for October 14, 1955, and March 29, 1957) with details of the latest single-seat version he mentions.—ED.]

Aroundabout

Strong Men Wanted. In *Nature*, Dr. D. R. Wilkie of the Department of Physiology, University College, London, publishes interesting and amusing calculations about muscle-powered flight. The smaller the animal, says Dr. Wilkie, the greater its power output per lb. of body weight. Thus a small dog with wings would do better than a winged man. Horses, delightfully enough, do not develop enough horse power to fly. But man-powered flight is possible though mighty strenuous, even for athletes. Sounds like one type of aircraft that John Fricker won't get in his log book.

*

Man of Bull. The recent R.A.F. Small Arms Association's championship marked the retirement of that organization's Secretary and Treasurer, Sqn. Ldr. "Jumper" Collins, O.B.E., a shootin' character known to all R.A.F. Small Arms enthusiasts from Lord Tedder down. During fifty years of successful competition shooting round the world he especially remembers the 1947 Stockholm Pistol Championships when the Swedes called our team "English Cowboys" because they wore bush hats and were addicted to milk drinking. Some affinity between bulls and cows, I suppose.

*

Wreductio ad Absurdum. At the latest Aviation Forum meeting, Capt. Lew Ambrose, Qantas' Regional Director, U.K. and Europe, spoke of the difficulties that beset an airline with such vast stage-lengths. Well, S.A.S., in their Caravelle "Get-there-quicker" publicity, have introduced the "40-minute hour," so if the British aircraft industry can guarantee a "1,000-yard mile" built into its airliners, Qantas' problem will be solved and our industry will be back in business down-under.

*

47 Years On. Aviation long ago started taking to itself some nice descriptive phrases, according to "Tips for Test Pilots" by Sidney F. Walker, R.N., some advice first published in 1912 and now reprinted in the *R.A.E. News*. What came to be known as "flying by the seat of your pants" was then termed "flying by instinct" or, better still, "by subconscious cerebration." Among the tips: "When flying across bodies of water, such as the English Channel, Irish Channel and Atlantic, as will probably be done before many years are over our head . . . it goes without saying that woollens will be worn. . . ."

*

From My Favourite Line Book

"He flies strictly according to the book—an absolute menace."

by Gordon

NOTES AND EVENTS

BAKELITE DISPLAY. — Aircraft parts moulded from reinforced Bakelite polyester resins are much in evidence on the stand of Bakelite, Ltd., at the International Plastics Exhibition (Olympia, June 17-27). Among the items on display is a neoprene treated radome for the Hawker Hunter, an instrument panel for the Vickers Vanguard, a fin tip for the Folland Gnat, and a Terylene-reinforced radome for the de Havilland Comet. The English Electric Thunderbird guided missile is represented by a 5-ft.-high nose-cone moulding.

AUTOMATIC DRILLING.—A new electronically controlled drilling machine capable of accurately positioning and drilling holes up to 2 in. dia. has been developed by E.M.I. Electronics, Ltd., and Wadkin, Ltd. Known as the E.M.I./Wadkin electronic positional drilling machine model TCD.1, the equipment has a large work table measuring 3 ft. 6 in. by 5 ft. 6 in. and has been designed especially for use with the E.M.I. control system. As with E.M.I.'s other control systems, this machine is automatic and operates from either punched tape or dial settings. No marking out or drilling jigs are required.

LIQUID OXYGEN.—British Oxygen Aro Equipment, Ltd., is jointly developing a civil transport liquid oxygen system in collaboration with The Walter Kidde Co., Ltd., whose equipment is already in service with B.O.A.C. in Comet 4s. In a 150-seat jet transport it is estimated that liquid oxygen storage results in a weight saving of 350-400 lb.

AEROQUIP HOSE.—Super Oil Seals and Gaskets, Ltd., manufacturers of Aeroquip Flexible Hose, under licence from the Aeroquip Corpn., Michigan, U.S.A., and SuPerfect Oil Seals, gave a film show for an invited audience of representatives of the aircraft manufacturing and operating industries at London Airport recently. The films, which were in colour and lasted some 2 hr., provided an instructive insight into the manufacturing and testing details and uses of Aeroquip Flexible Hose in aircraft installations as well as in other fields.

AERONAUTICAL ENGINEERING.—A chapter containing notes on aeronautical engineering opportunities is included in the recently released illustrated booklet, "Professional Engineers." Published by the Central Youth Employment Executive in its "Choice of Careers" series, the booklet is available from the Stationery Office, price 1s. 9d. net.

Company Notices

NEW COMPANIES

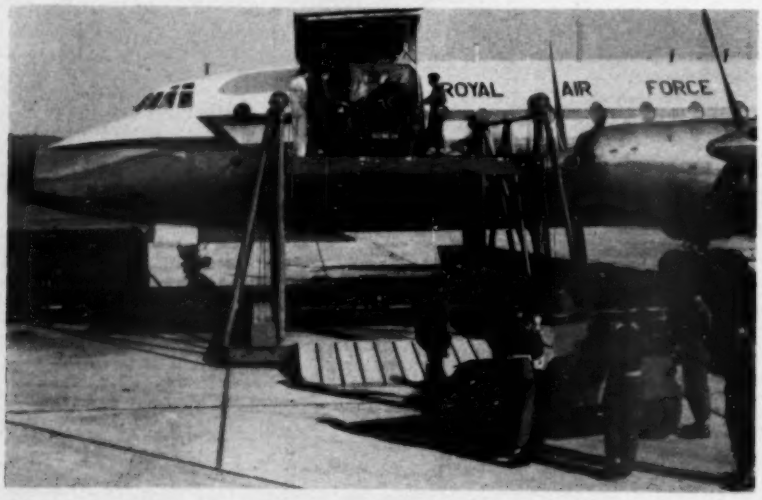
John Morgan (Jemca), Ltd. (629,219).—Private co. Reg. May 29. Cap. £25,000 in £1 shs. Objects: To carry on the business of manufacturers of and dealers in accessories for motor vehicles, locomotives, railway carriages, aeroplanes, motorcycles, motor scooters and bicycles, etc. Directors are Merlin J. Morgan, 482 Streetsbrook Road, Solihull, Warwicks, Henry G. Bridgewater, 36 Westfields Road, Armitage, Staffs, and Mollie F. Morgan. Solrs.: Parkhouse and Allee, Birmingham, 3. Registered office: 59/61 Camden Street, Birmingham, 1.

North-South Airlines, Ltd. (629,216).—Private co. Reg. May 29. Cap. £10,000 in £1 shs. Objects: To carry on the business of general carriers of goods and passengers by aeroplane, motor or otherwise, etc. Subscribers (each with one share) are: William J. Shackleton, 10 Piccadilly, Bradford, and Geoffrey G. Rennard, Warren House, Yeadon, Leeds. Geoffrey G. Rennard and Betty H. Rennard are the directors. Solrs.: W. B. D. Shackleton, Bradford.

Technical Art (Bristol), Ltd. (629,081).—Private co. Reg. May 28. Cap. £100 in £1 shs. Objects: To carry on the business of technical illustrators for the aircraft, motor and other industries, designers, illustrators and printers of technical and other specialized publications, etc. Directors are David H. Phipps, 40 Shrubbery Road, Downend, Bristol, Norman Duro, 22 Brynland Avenue, Bishopton, Bristol, 7. Sec.: R. H. D. Smith.

INCREASE OF CAPITAL

Weyburn Engineering Co., Ltd. (306,023).—Precision engineers, etc. Weyburn Engineering Works, Elstead, Surrey. Increased by £150,000 in 5s. ord. shs. beyond reg. cap. of £210,000



FREIGHT-LOADER.—Developed by Short Brothers and Harland, Ltd., for use with Britannia C.1s of R.A.F. Transport Command, this lift dismantles for stowage in the aircraft. Driven from a standard 10 kW. servicing trolley, it can raise a load of 8,000 lb. through 11½ ft. in 3 min.

Aviation Calendar

June 26-29.—11th Air Tour of Sicily, organized by Palermo Aero Club, **Palermo.**

June 27-28.—Aix les Bains rally, organized by Savoy Ae.C., **France.**

June 27-29.—R.Ae.C. invitation air rally at **La Baule,** near St. Nazaire, France.

July 4.—R.Ae.C. invitation air rally at **Deauville,** Calvados, France.

July 4-5.—13th Anjou rally, organized by l'Ouest Aéro Club, at **Angers,** France.

July 4-5.—Medical aviation assembly, at **Vittel,** France.

July 5.—Aerobatic, gliding and parachuting *criterium,* organized by R. Belgian Ae.C., at **Gosselies,** Belgium.

July 6.—R.Ae.S. Halton Branch lecture, "Development of the P.1," by F. W. Page (English Electric) at the Branch H.Q., R.A.F. **Halton,** at 18.45 hrs.

July 9-11.—National Air Races and British Lockheed international aerobatic trophy at Coventry Civic Airport, Baginton, **Coventry.**

July 10.—Helic. Assn. of Gt. Britain A.G.M., at 19 Park Lane, **London,** W.1, at 15.00 hrs.

July 11-12.—Rally organized by Pescara Ae.C., **Italy.**

July 12.—Tiger Club display at **Sywell aerodrome,** Northampton.

New Patents

APPLICATION ACCEPTED

817,156.—Sir J. R. C. Quilter. Parachute canopy construction. July 3, 1957. (July 4, 1956.)

Printed specifications of the above will be available on July 22, 1959, and the opposition period will expire on October 22, 1959.

Personal Notices

BIRTHS

Attenborough.—On May 26, at Caergeiliog, Anglesey, to Norah (*née* Ridley), wife of Sqn. Ldr. R. G. Attenborough, M.R.C.S., L.R.C.P., R.A.F.—a son.

Carr.—On May 31, to Heather, wife of Sqn. Ldr. Philip Carr, R.A.F.—a son.

Cloutman.—On June 1, at P.M.R.A.F. Hospital, Halton, to Sylvia, wife of Wg. Cdr. Cloutman, R.A.F.—a daughter.

Edwards.—On May 21, at P.M.R.A.F. Hospital, Halton, to Nan, wife of Sqn. Ldr. H. Edwards—a daughter (Sarah).

Gale.—On May 25, at P.M.R.A.F. Hospital, Halton, to Diana (*née* Scraggs), wife of Flt. Lt. J. F. Gale, R.A.F.—a son.

Kelsey.—On May 28, to Judith (*née* Longley), wife of Flt. Lt. W. Kelsey—a daughter.

Knox.—On May 23, at P.M.R.A.F. Hospital, Halton, to Sheila (*née* Swan), wife of Sqn. Ldr. J. S. Knox—a daughter (Jenny Louise).

Mackenzie.—On May 25, at R.A.F. Hospital, Cosford, to Elizabeth, wife of Sqn. Ldr. K. F. Mackenzie, R.A.F.—a son (Paul Dominic).

Murgatroyd.—On May 24, at R.A.F. Hospital, Nocton Hall, Lincoln, to Patricia (*née* Munro), wife of Flt. Lt. C. N. Murgatroyd—a daughter (Susan Caroline).

Nichols.—On May 23, at Catterick Camp Military Hospital, to Hazel, wife of Flt. Lt. K. E. Nichols, R.A.F.—a daughter (Tacye Amanda).

Nisbet.—On May 27, at R.A.F. South Cerney, to Sarah (*née* Marnham), wife of Flt. Lt. J. E. Nisbet—a daughter (Andrea Elizabeth Jean).

Phillips.—On May 24, at Harrogate Hospital, to Sheila, wife of Sqn. Ldr. V. Phillips, D.F.C.—a daughter.

Pilcher-Clayton.—On May 25, at R.A.F. Hospital, Ely, to Elizabeth, wife of Flt. Lt. M. A. Pilcher-Clayton, R.A.F.—a son (Guy).

Sheppard.—On May 28, at Epsom District Hospital, to Jennifer (*née* Ray), wife of Flg. Off. I. A. L. Sheppard, R.A.F.—a son.

Thurgood.—On June 3, at St. Teresa's Hospital, Wimbledon, to Audrey, wife of Derek Thurgood—a son.

MARRIAGE

Armandias-Graham.—On May 30, 1959, Louis Sylvio Armandias of Ellingham House, Pittville Lawn, Cheltenham, son of V. Armandias and the late Mrs. Armandias of Paris, and Jean Graham of Somerset House, Claremont Road, Seaford, daughter of Captain I. H. Whiteing, late Loyal Regiment, and the late Mrs. Whiteing, of 30 The Mount, Guildford.

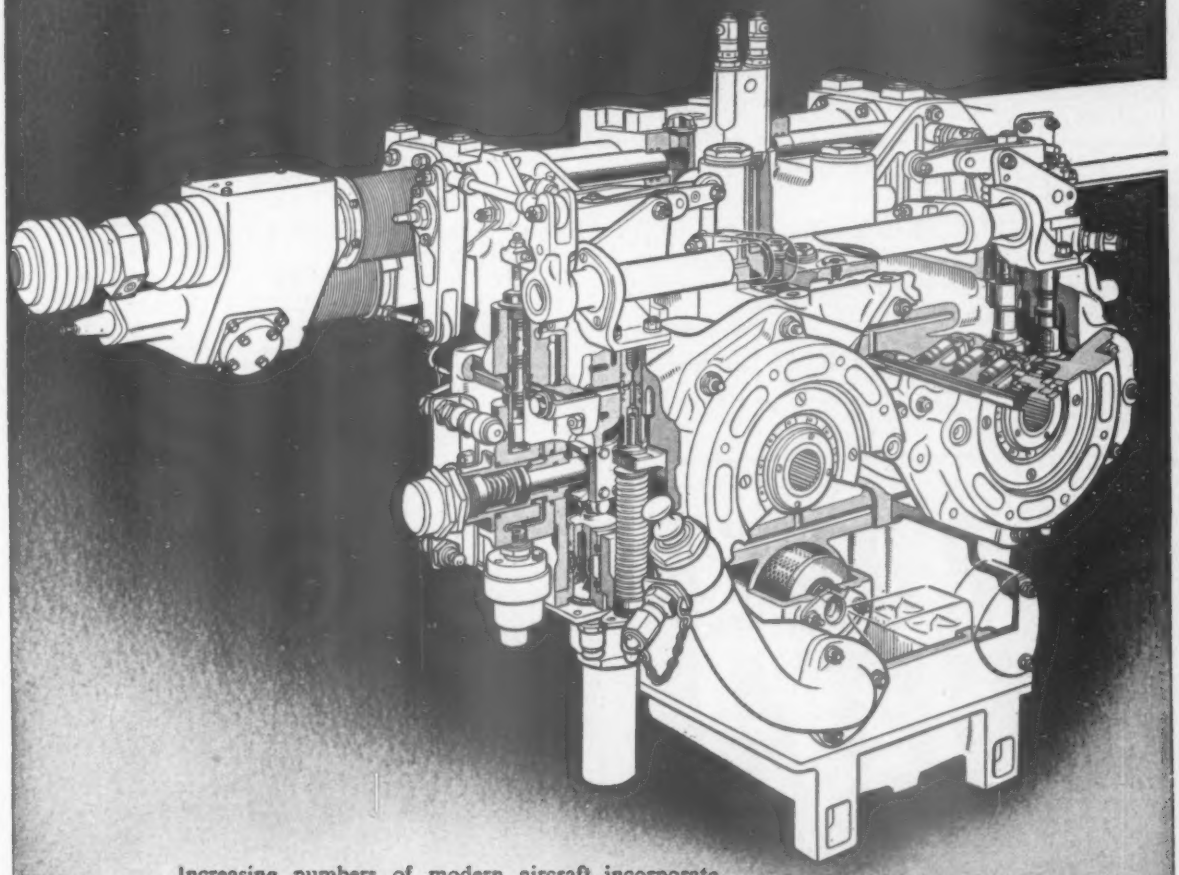
DEATHS

Essex.—On June 5, Air Vice-Marshal Bertram Edward Essex, C.B., C.B.E., R.A.F. (Retd.). S.A.S.O., Maintenance Command, from 1953 to 1956.

Millard.—On May 29, in a flying accident, Flg. Off. Anthony Lambert Millard, R.A.F.

Rasmusen.—On May 26, Sqn. Ldr. Charles Francis Rasmusen, R.A.F. (Retd.).

Power Control



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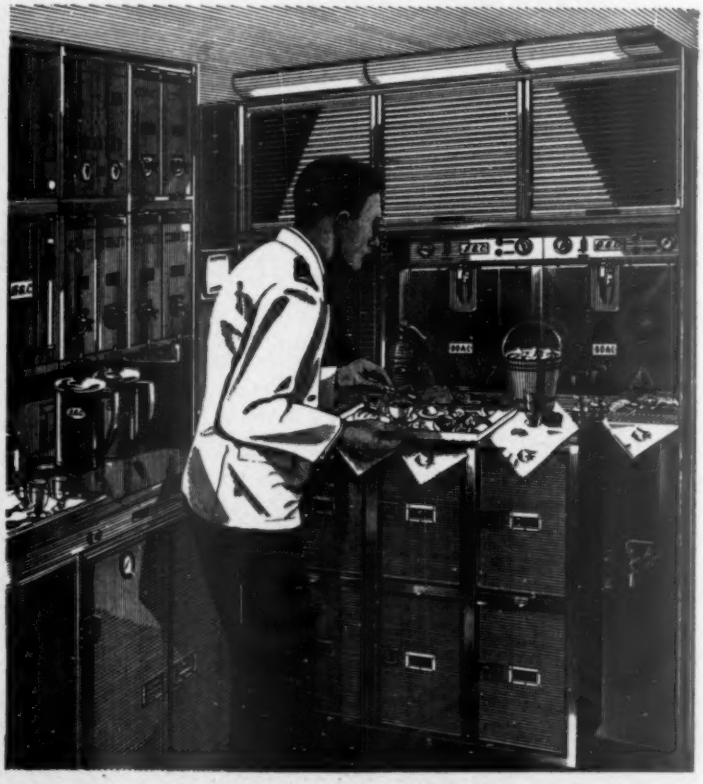

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APACHES.

1955 Super Custom 1225 T.T. 150, nil engines, dual omni, ADF Simplexer, rot. beacon, dual gens., £6,795.
1956 Super Custom 900 T.T., nil hr. engines, dual gens., aux. tanks, £9,000.
1957 Super Custom T.T. 703, engs. 703, rot. beacon aux tanks, dual gens., ADF Omni, Simplexer, etc., etc., £10,030.
1958 Super Custom Mk. II omni, VC27, ADF 12E, aux. tanks, dual gens., auto pilot, etc., etc., £12,400.

WATCH for Cessna's next week.

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GEMINI M65, Cirrus Minor 2As, port 170, starboard 270, dual, new tanks, C. of A. March, 1961. Ekco CE1140 11-channel, excellent specimen, £2,250. Arnold G. Wilson, Ltd., Regent St., Leeds, 2. 494-4

TWO fine Gemini aircraft for sale, both fitted Murphy V.H.F., one has Marconi radio-compass and dual control. Air Couriers, Ltd., Croydon Airport, Surrey. 495-8851

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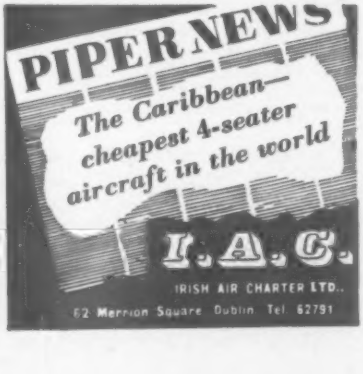

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This application will be considered by the Council under their Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to this application must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making ofrepresentations or objections. 494-5

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